

Workshop Manual OCTAVIA II 2004 ➤

1.4/90 kW TSI engine								
Engine ID	CAX A							

Edition 09.08

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List of Workshop Manual Repair Groups

Repair Group

- 00 - Technical data
- 01 - Self-diagnosis
- 10 - Removing and installing engine
- 13 - Crankgear
- 15 - Cylinder Head, Valve Gear
- 17 - Lubrication
- 19 - Cooling
- 20 - Fuel Supply
- 21 - Turbocharging
- 24 - Fuel Formation, Injection
- 26 - Exhaust System
- 28 - Ignition system



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.



Contents

00 - Technical data	1
1 Technical data	1
1.1 Engine number	1
1.2 Engine characteristics	2
01 - Self-diagnosis	3
1 Self diagnosis, safety measures, cleanliness regulations, directions	3
1.1 Self-diagnosis	3
1.2 Safety precautions when working on the fuel supply system	3
1.3 Release pressure in the high pressure area of the fuel system	4
1.4 Rules of cleanliness to observe when working on the fuel supply system	5
1.5 Safety measures to apply when working on the fuel injection and ignition system	5
1.6 General notes on the injection system	6
1.7 General notes on the ignition system	7
1.8 General instructions for charge air system	7
1.9 Additional instructions when undertaking assembly work on the air-conditioning system	8
10 - Removing and installing engine	9
1 Removing and installing engine	9
1.1 Removing and installing engine trim panel	9
1.2 Removing engine	9
1.3 Securing the engine to the assembly stand	17
1.4 Installing the engine	18
2 Assembly bracket	22
2.1 Unit mounting - summary of components	22
2.2 Checking and adjusting the assembly bracket	23
13 - Crankgear	26
1 V-ribbed belt drive	26
1.1 V-ribbed belt drive - Summary of components for vehicles with air conditioning system	26
1.2 Removing and installing V-ribbed belt	27
1.3 Removing and installing the bracket for AC compressor	28
2 Camshaft drive	30
2.1 Camshaft drive - Summary of components	30
2.2 Removing and installing the timing case	32
3 Sealing flanges and flywheel	37
3.1 Summary of components	37
3.2 Removing and installing flywheel	38
3.3 Replacing gasket ring for crankshaft -on the belt pulley side-	39
3.4 Removing and installing crankshaft-belt pulley	40
3.5 Removing and installing the sealing flange -on the gearbox side-	43
4 Crankshaft	49
4.1 Summary of components	49
4.2 Pulling out and driving in the needle bearing of the crankshaft	50
5 Pistons and conrods	52
5.1 Summary of components	52
5.2 Inspect piston, piston rings and cylinder bore	53
5.3 Separating new conrod	54
15 - Cylinder Head, Valve Gear	56
1 Cylinder head - part 1	56
1.1 Summary of components	56



1.2	Change camshaft fixer/locator T10171 in camshaft fixer/locator T10171 A	58
1.3	Test timing	58
1.4	Setting the timing	61
1.5	Removing and installing timing chain and drive chain for oil pump	67
2	Cylinder head - part 2	75
2.1	Removing and installing camshaft housing	75
2.2	Removing and installing cylinder head	80
2.3	Testing the compression	83
2.4	Testing the combustion chamber for tightness	83
3	Valve gear	85
3.1	Valve gear - Summary of components	85
3.2	Checking the axial play of the camshaft	87
3.3	Reworking valve seats	87
3.4	Inspect valve guides	90
3.5	Replacing valve stem seals	90
17	Lubrication	92
1	Lubrication system	92
1.1	Summary of components of lubrication system	93
1.2	Removing and installing oil pan	95
1.3	Removing and installing oil pump	97
1.4	Removing and installing engine oil cooler	99
1.5	Testing oil pressure and oil pressure switch	100
19	Cooling	102
1	Cooling system	102
1.1	Connection diagram for coolant hoses	102
1.2	Draining and filling up coolant	103
2	Coolant pumps, coolant regulator	106
2.1	Coolant pump - Summary of components	106
2.2	Removing and installing belt pulley for coolant pump	106
2.3	Removing and installing coolant pump	107
2.4	Removing and installing coolant recirculation pump V50	108
2.5	Summary of components of coolant regulator	109
3	Radiator and radiator fan	110
3.1	Parts of cooling system on the side next to the body - Summary of components	110
3.2	Removing and installing fan shroud for radiator fan V7 and V35	111
3.3	Removing and installing radiator	112
3.4	Checking the coolant system for leaktightness	113
20	Fuel Supply	116
1	Fuel tank and fuel delivery unit	116
1.1	Fuel tank - Summary of components	116
1.2	Fuel filter - Summary of components	118
1.3	Extract fuel from the fuel tank	118
1.4	Removing and installing the fuel tank	120
1.5	Removing and installing fuel delivery unit	122
1.6	Removing and installing the sender for fuel gauge display G	124
1.7	Testing fuel pump	125
2	Electronic Engine Power Control (Electronic throttle)	141
2.1	Accelerator pedal module - Summary of components	141
2.2	Removing and installing accelerator pedal module	141
3	Activated charcoal container system	144
3.1	Activated charcoal container system - Summary of components	144
3.2	Checking the fuel tank venting	144



21 - Turbocharging	147
1 Exhaust gas turbocharger	147
1.1 Exhaust turbocharger - Summary of components	147
1.2 Removing and installing exhaust gas turbocharger	149
1.3 Testing exhaust turbocharger pressure box	152
1.4 Removing and installing pressure box for exhaust turbocharger	154
1.5 Setting exhaust turbocharger pressure unit	156
2 Charge air system with exhaust gas turbocharger	162
2.1 Charge air system - Summary of components	162
2.2 Removing and installing the additional radiator for coolant of charge air system	163
24 - Fuel Formation, Injection	165
1 Fitting location of the injection system	165
2 Intake manifold and fuel distributor	169
2.1 Intake manifold - Summary of components	169
2.2 Bottom part of intake manifold/fuel distributor with injection valves - Summary of components	171
2.3 Removing and installing the throttle valve control unit J338	171
2.4 Clean throttle valve control unit J338	173
2.5 Removing and installing intake manifold	174
3 Air filter	176
3.1 Air filter - Summary of components	176
3.2 Removing and installing air filter	176
4 High pressure pump	178
4.1 High pressure pump - Summary of components	178
4.2 Removing and installing the high pressure pump	179
5 Injection valves	182
5.1 Removing and installing injection valves	182
5.2 Replace Teflon gasket ring and supporting washer at injection valve	183
6 Testing components	187
6.1 Check fuel pressure sender G247	187
6.2 Removing and installing fuel pressure sender G247	189
7 Engine control unit	192
7.1 Removing and installing engine control unit	192
26 - Exhaust System	194
1 Removing and installing parts of the exhaust system	194
1.1 Catalytic converter and component parts - Summary of components	194
1.2 Middle or rear part of the exhaust system - Summary of components	196
1.3 Removing and installing catalytic converter	196
1.4 Replacing middle or rear part of the exhaust system	198
1.5 Aligning exhaust system free of stress	199
1.6 Inspecting the exhaust system for leaktightness	200
28 - Ignition system	201
1 Ignition system	201
1.1 Ignition system - Summary of components	201
1.2 Removing and installing ignition coils with power output stages	202
1.3 Removing and installing engine speed sender G28	203



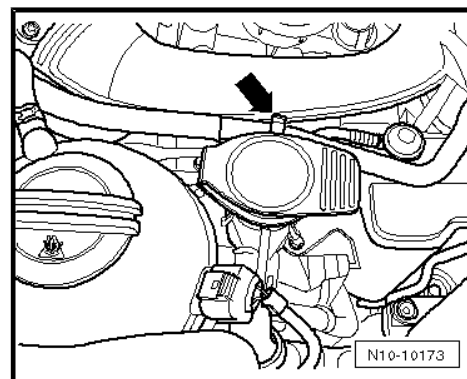
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00 – Technical data

1 Technical data

1.1 Engine number

- Unhook the activated charcoal filter hose at the hose clip -arrow-.

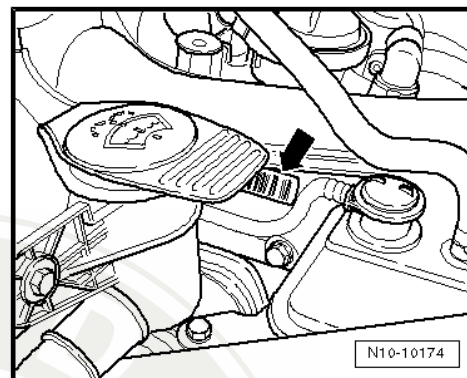


The engine identification character and the engine number can be found on the sticker -arrow- at the timing case.

The engine number consists of up to nine digits (alphanumeric). The first part represents the “engine code” (a maximum of 3 identification letters), the second part the “serial number”. If more than 999.999 engines with the same engine code were produced then the first digit of the six part section will be replaced by a letter.

Vehicles with four-digit engine identification characters

Four-digit engine identification characters are used. The first 3 digits refer to the mechanical construction of the engine and are type-punched onto the engine as done previously. The fourth digit refers to the output and torque of the engine and depends upon the engine control unit. You can find the four digit engine identification characters on the vehicle data sticker ⇒ Maintenance ; Octavia II ; vehicle data sticker and on the engine control unit.





1.2 Engine characteristics

Identification characters	CAXA
Manufactured	11.08 ?
Exhaust limit values conforming to	EU-4 ¹⁾ , EU-5
Displacement	1390 cm ³
Power output	90/5000 kW at rpm
Torque	200/1500-4000 Nm at rpm
Bore	76,5 Ø mm
Stroke	75,6 mm
Compression ratio	10:1
Cylinder / valves per cylinder	4/4
RON	unleaded 95 ²⁾
Ignition system/fuel injection	Motronic MED 17.05.20
Type of fuel preparation	Direct injection homogeneous
Knock control	1 sensor
Lambda control	2 Lambda probes
Three-way catalytic converter	yes
Exhaust gas recirculation	no
Balancing shaft module	no
Intake manifold change-over	no
Camshaft adjustment	yes
Secondary air system	no
Exhaust gas turbocharger	yes

¹⁾ according to EU-5

²⁾ at least 91 RON in exceptional cases, although engine output is reduced



01 – Self-diagnosis

1 Self diagnosis, safety measures, cleanliness regulations, directions

1.1 Self-diagnosis

This repair group is no longer applicable.

For this use "Vehicle self-diagnosis", "Measuring method" and "Targeted fault finding" ⇒ Vehicle diagnosis, testing and information system VAS 5051.

1.2 Safety precautions when working on the fuel supply system



WARNING

- ◆ *The safety measures for the pressure reduction in the high pressure area of the fuel system must be observed ⇒ [page 4](#).*
- ◆ *The fuel system is under pressure! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Place a clean cleaning cloth around the connection point before detaching wiring. Reduce pressure by carefully removing the wiring.*

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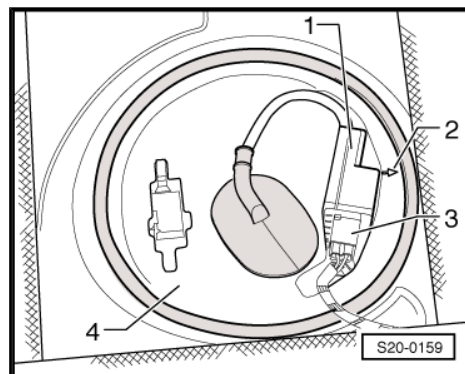
- ◆ The fuel pump is activated when the ignition is switched on and by the door contact switch of the driver door. Before opening the fuel system and for reasons of safety, if the battery is not disconnected, the plug -3- must be disconnected from the fuel pump control unit.



Caution

When undertaking all assembly work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, the active charcoal container-unit, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.*



When removing and installing the fuel gauge sender or the fuel delivery unit from a full or partly filled fuel tank, pay attention to the following points:

- ◆ The extraction hose of an exhaust extraction system which is switched on, must be positioned close to the assembly opening of the fuel tank in order to extract the released fuel vapours, even before the work is commenced. If no exhaust extraction system is available, a radial fan (motor not in air flow of fan) with a delivery volume of more than 15 m³/h must be used.
- ◆ Avoid skin contact with fuel!
- ◆ Wear fuel-resistant gloves!

1.3 Release pressure in the high pressure area of the fuel system



WARNING

- ◆ *The injection system consists of a high pressure part (max. pressure of 12 MPa = 120 bar) and a low pressure part (pressure of approx. 0.6 MPa = 6 bar).*
- ◆ *Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced. The procedure for this is described below.*

- Connect the ⇒ Vehicle diagnosis, testing and information system VAS 5051 and carry out the targeted function "remove high fuel pressure".
- Switch off ignition.



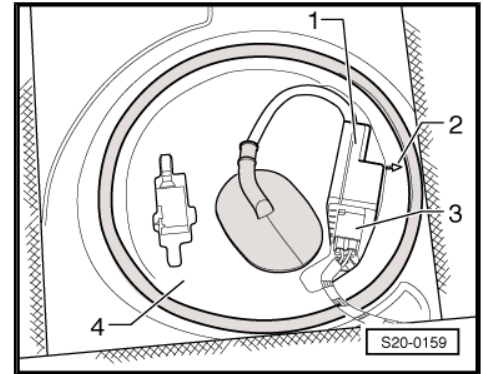
- For safety reasons before opening the fuel system disconnect the plug -3- from the fuel pump control unit.



WARNING

The fuel lines are pressurized! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Before opening the high pressure part lay cleaning cloths around the connection point.

- Now lay a clean cleaning cloth around the connection point and carefully open it up, in order to reduce the remaining pressure of approx 0.6 MPa (6 bar). Collect the fuel which flows out.



Note

- ◆ *Interrogate the fault memory for the engine control unit at the end of the following work and delete all the fault entries.*
- ◆ *If the fault memory was erased, the readiness code must be generated ⇒ Vehicle diagnosis, testing and information system VAS 5051.*

1.4 Rules of cleanliness to observe when working on the fuel supply system

Carefully observe the following five rules for cleanliness when working on the fuel supply/injection system:

- ◆ Thoroughly clean the connection points and their surroundings before releasing.
- ◆ Place removed parts on a clean surface and cover. Do not use fuzzy cloths!
- ◆ Carefully cover or close opened components if the repair is not completed immediately.
- ◆ Only install clean parts: Remove spare parts from their wrapping immediately before installing. Do not use any parts which have been stored unwrapped (e.g. in tool boxes).
- ◆ When the system is opened: Avoid using compressed air. Avoid moving the vehicle.

1.5 Safety measures to apply when working on the fuel injection and ignition system



WARNING

- ◆ ***The safety measures for the pressure reduction in the high pressure area of the fuel system must be observed ⇒ [page 4](#).***
- ◆ ***The fuel system is under pressure! Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Place a clean cleaning cloth around the connection point before detaching wiring. Reduce pressure by carefully removing the wiring.***

Observe the following points to prevent injury to persons and/or damage to the injection and ignition system:

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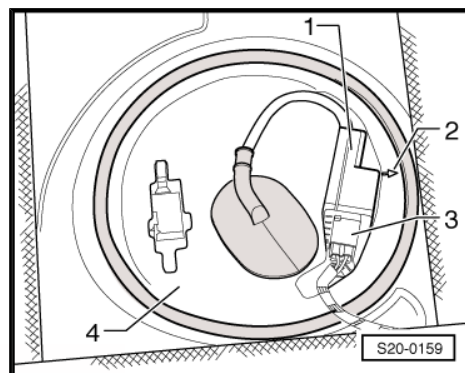
- ◆ Do not touch or remove ignition leads and ignition coils with power output stages with the engine running or at start speed.
- ◆ Ignition must be switched off before disconnecting and re-connecting the cables of the fuel injection and the ignition system as well as of the test equipment.
- ◆ If the engine must be operated at start speed without the engine starting, as for example, when checking the compression pressure, open lid of fuse carrier in the engine compartment and unplug fuse for Motronic current supply relay -J271 -
⇒ Current flow diagrams and Fitting locations.
- ◆ The fuel pump is activated when the ignition is switched on and by the door contact switch of the driver door. Before opening the fuel system and for reasons of safety, if the battery is not disconnected, the plug -3- must be disconnected from the fuel pump control unit.



Caution

When undertaking all assembly work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ ***Lay lines of all kinds (e.g. for fuel, hydraulic fluid, the active charcoal container-unit, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.***
- ◆ ***In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.***



If test and measuring devices are required during test drives observe the following:

- ◆ Always secure the test and measuring devices on the rear seat and have a second person operate them there.
- ◆ If the test and measuring devices are operated from the passenger seat, the passenger could be injured by the release of the passenger airbag in the event of an accident.

1.6 General notes on the injection system

Repairing ignition ⇒ [page 201](#) .

- ◆ The engine control unit is equipped with self-diagnosis. Before repairs and also for fault finding, first of all interrogate the fault memory. Also check the vacuum hoses and connections (un-metered air).
- ◆ Fuel hoses in the engine compartment must only be secured with spring-type clips ⇒ electronic catalogue of original parts .
The use of clamp-type or screw-type clips is not allowed.
- ◆ A minimum voltage of 11.5 V is required for perfect functioning of the electrical components.
- ◆ Do not use sealants containing silicone. Traces of silicone elements drawn in by the engine are not burnt in the engine and damage the lambda probe.
- ◆ If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the engine control unit. Then if necessary the control unit must be adapted ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- ◆ When opening the driver door the fuel pump is activated for 2 seconds in order to build up the pressure in the fuel system.



- ◆ Certain inspections may cause the control unit to detect and store a fault. It is therefore necessary to interrogate the fault memory after having completed all inspections and repairs, and if necessary delete ⇒ Vehicle diagnosis, testing and information system VAS 5051.

Safety measures ⇒ [page 5](#) .

1.7 General notes on the ignition system

- ◆ Switch off the ignition before disconnecting and connecting the battery, as this may damage the 4AV control unit.
- ◆ The engine control unit is equipped with a self-diagnosis system; inspect ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- ◆ A minimum voltage of 11.5 V is required for perfect functioning of the electrical components.
- ◆ Certain inspections may cause the control unit to detect and store a fault. It is therefore necessary to interrogate the fault memory after having completed all inspections and repairs, and if necessary delete ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- ◆ If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the engine control unit. Then if necessary the control unit must be adapted ⇒ Vehicle diagnosis, testing and information system VAS 5051.

Safety measures ⇒ [page 5](#) .

Setting data, spark plugs ⇒ Maintenance ; Octavia II .

1.8 General instructions for charge air system



WARNING

When undertaking all assembly work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, the active charcoal container-unit, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *Ensure that there is adequate free access to all moving or hot components.*

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Caution

In case a mechanical damage to the exhaust gas turbocharger is found, e.g. damage to the compressor wheel, it is not sufficient to only replace the turbocharger. In order to avoid consequential damage, perform the following tasks:

- ◆ *Clean all oil lines.*
- ◆ *Change the engine oil and replace the oil filter*
- ◆ *Inspect the air filter housing, the air filter element and the intake hoses for contaminations.*
- ◆ *Inspect the whole charge-air routing and the charge air cooler for foreign bodies.*

If foreign bodies are detected in the charge air system, the complete charge-air routing must be cleaned and if necessary the charge air cooler must also be replaced.

- ◆ The charge-air system must be tight.
- ◆ Always replace self-locking nuts.
- ◆ Hose connections and hoses for the charge air system must be free of oil and grease before being installed.
- ◆ Only use approved clamps for securing the hose connections
⇒ Electronic Catalogue of Original Parts .
- ◆ Use pliers for spring strap clamps to fit the spring strap clips.
- ◆ Before connecting the oil feed line, fill the exhaust turbocharger via the connection fitting with engine oil.
- ◆ after installing the exhaust turbocharger run the engine approx. 1 minute in idle and do not increase speed immediately in order to ensure the supply of oil to the turbocharger.

1.9 Additional instructions when undertaking assembly work on the air-conditioning system



WARNING

Do not open the refrigerant circuit of the air conditioning system.



Note

In order to avoid damage to the condenser as well as to the refrigerant lines and hoses, ensure that the lines and hoses are not over-tensioned, kinked or bent.

Steps which should be taken in order to remove and install the engine without opening the refrigerant circuit.

- Remove the holding clamp(s) of the coolant lines.
- Remove AC compressor from the bracket ⇒ [page 26](#) .
- Mount the AC compressor in such a way that the refrigerant lines/hoses are not under tension.

10 – Removing and installing engine

1 Removing and installing engine

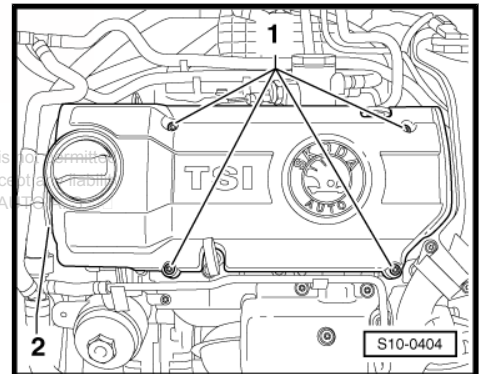
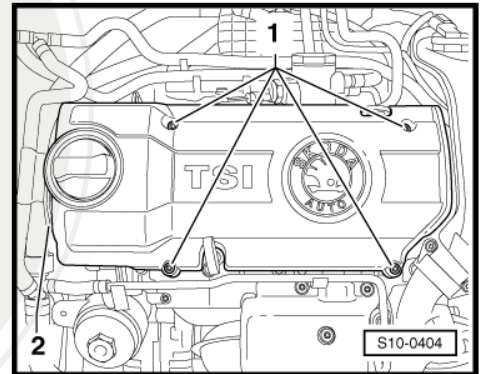
1.1 Removing and installing engine trim panel

Removing

- Unscrew the fixing screws -1- of the engine cover.
- Unhook the coolant hoses -2- at the engine cover and pull the engine cover upwards.

Install

- Place the engine cover onto the camshaft housing and hook the coolant hoses -2- in the holder.
- Tighten fixing screws -1- to 8 Nm.



1.2 Removing engine

Special tools and workshop equipment required

- ◆ Engine/gearbox jack , e.g. -V.A.G 1383 A-
- ◆ Double ladder , e. g. -VAS 5085-
- ◆ Engine mount -T40075A-
- ◆ Removal tool for inner lining of the door panel -MP8-602/1 -
- ◆ Pliers for spring strap clamps
- ◆ Catch pan e.g. -VAS 6208-
- Before removing the engine, interrogate the fault memory of all control units ⇒ Vehicle diagnosis, testing and information system VAS 5051.



Note

- ◆ *The engine is removed downwards together with the gearbox.*
- ◆ *All cable straps that have been loosened or cut open when the engine was removed must be fitted again in the same location when the engine is installed again.*
- ◆ *Leave the ignition key in the ignition lock so that the steering lock does not click into place.*
- ◆ *Collect drained coolant in a clean container for reuse or proper disposal.*



Caution

When undertaking all assembly work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ ***Lay lines of all kinds (e.g. for fuel, hydraulic fluid, the active charcoal container-unit, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.***
- ◆ ***In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.***

Observe all safety measures and notes for assembly work on the fuel, injection and ignition system and the charge air system as well as rules for cleanliness ⇒ [page 3](#) .



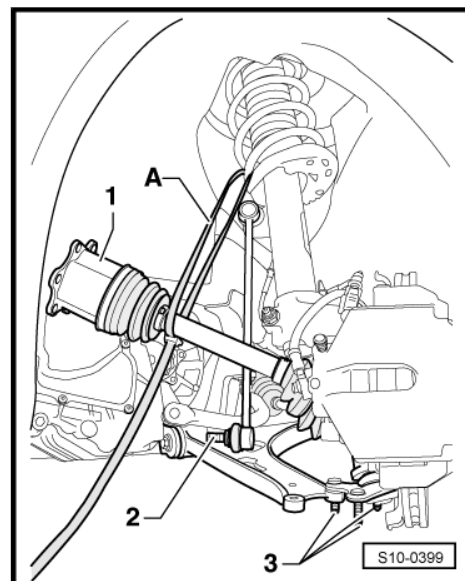
WARNING

***Release pressure in the high pressure area of the fuel system
⇒ [page 4](#) .***

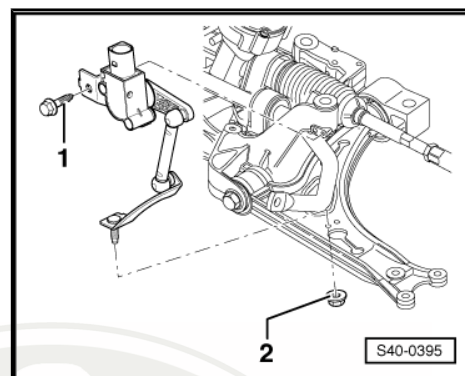
- Remove engine cover ⇒ [page 9](#) .
- Remove air filter ⇒ [page 176](#) .
- Before disconnecting the battery, if necessary remove the adapter for the anti-theft wheel bolts from the luggage compartment.
- Remove battery and battery tray ⇒ Electrical System; Rep. Gr. 27 .
- Remove the right and left wheelhouse liner ⇒ Body Work; Rep. Gr. 66 .
- Drain the coolant from the engine cooling system and the charge air cooling system ⇒ [page 103](#) .
- Remove drive shaft to the right ⇒ Chassis; Rep. Gr. 40 .
- Unscrew the left drive shaft from the flange shaft of the gearbox.

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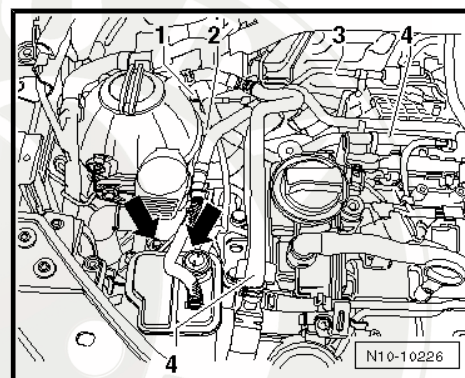
- Unscrew the nut from the left coupling rod -2- of the anti-roll bar and press the coupling rod off the anti-roll bar.
- Unscrew the nuts from the left steering joint -3- and press the steering joint out of the suspension arm.



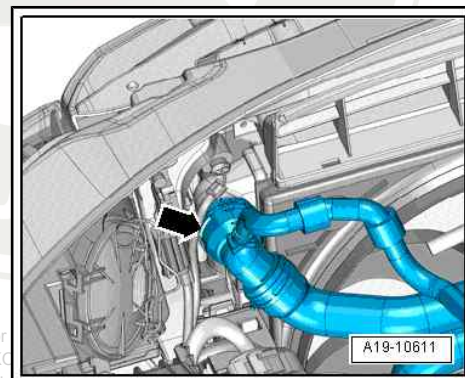
- Unscrew the nut -2- from the track control arm on installed front left vehicle level sensor -G78- .
- Turn steering to full left lock.
- Swivel the steering joint outwards and secure the drive shaft -1- with strap -A- in the wheelhouse.
- Insert a pin screw in the suspension arm in order to stabilise the steering joint.



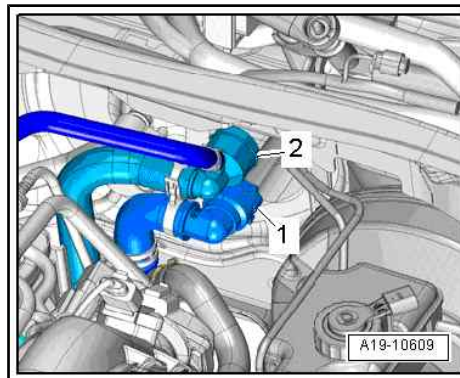
- Disconnect the fuel feed line -1- and the cable to the activated charcoal filter -2-. To do so press in the securing ring.
- Remove the hose -3- from the activated charcoal filter solenoid valve 1 - N80- to the activated charcoal filter.
- Pull the activated charcoal filter upwards and turn the fixing screws -arrows- out of the bracket.
- Remove coolant hoses -4-.



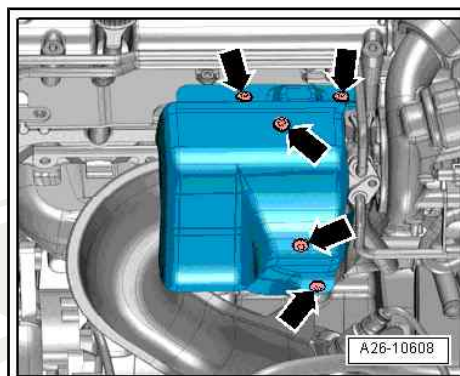
- Release the coolant hose -arrow- at the radiator on the top left and remove.



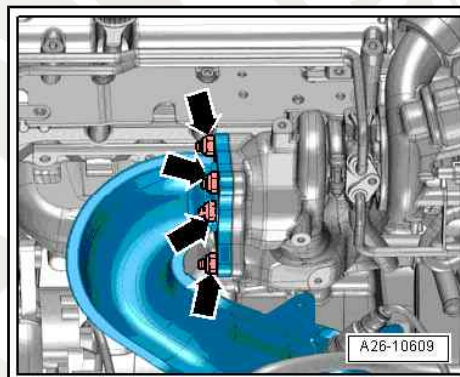
- Release the coolant hoses -1- and -2- at the heat exchanger and pull them off.



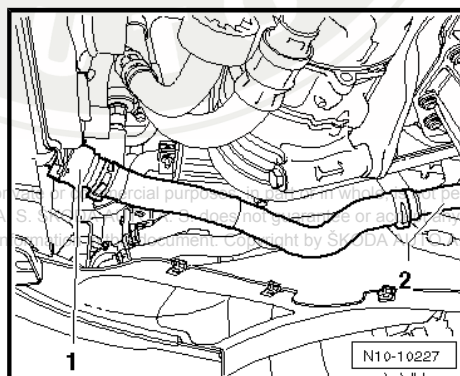
- Release fixing screws -arrows- and remove the heat shield from the exhaust turbocharger.



- Unscrew fixing nuts at turbocharger -arrows-.



- Remove coolant pipe -2-.



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- Disconnect plug -1- from oil level and oil temperature sender -G266- .
- Unclip the bracket -2- for the electrical cable of the oil level and oil temperature sender -G266 - from the support at the assembly carrier.

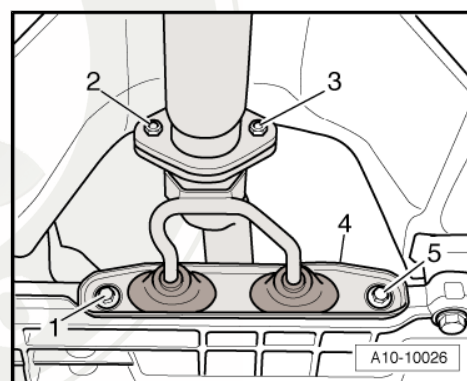
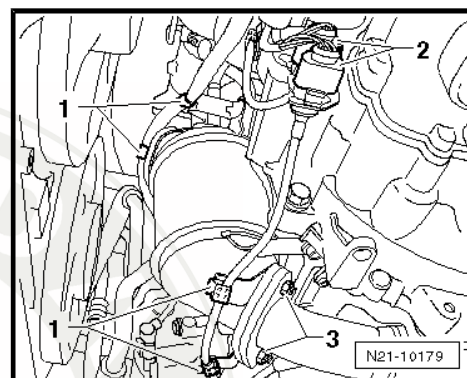
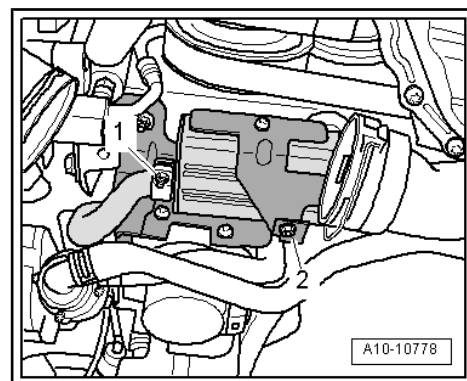
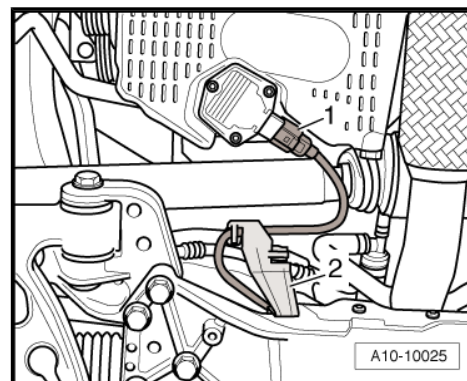
Vehicles with auxiliary heating.

- Remove coolant pipe -2-.
- Slacken the clamp -1- and release the screw -2-.
- Remove exhaust pipe of auxiliary heating.

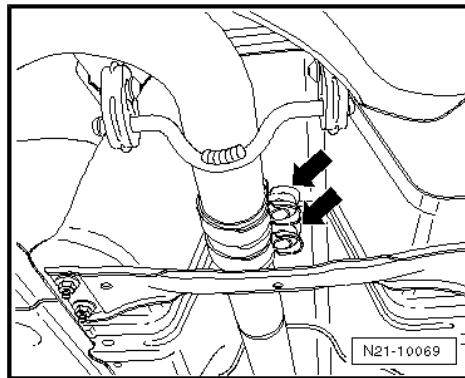
Continued for all vehicles

- Expose cables -1- at catalytic converter.
- Separate plug connections -2-.
- Unscrew fixing nuts -3- and remove the seal.
- Remove catalytic converter downwards.

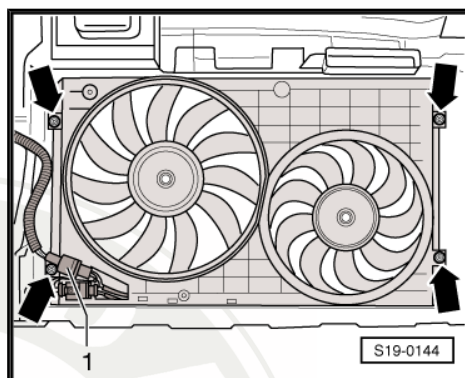
- Unscrew fixing nuts -2- and -3- and remove the seal.
- Unscrew screws -1- and -5- and remove the pre-exhaust pipe with the bracket -4-.



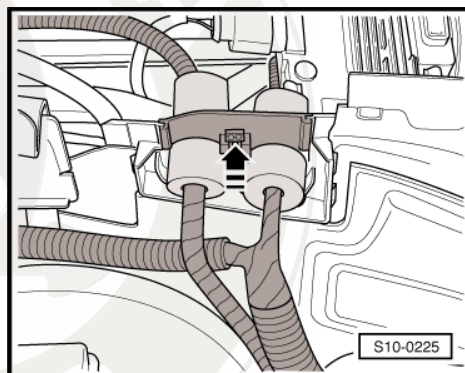
- Slacken the fixing screws of the clamping sleeve -arrows- and pull the intermediate pipe of the exhaust system towards the rear.
- Remove/unclamp all electrical lines from the gearbox, generator and starter motor and uncover them.
- Remove/unclamp all other necessary electrical cables from the engine.
- Disconnect the vacuum and bleeder hoses from the engine.



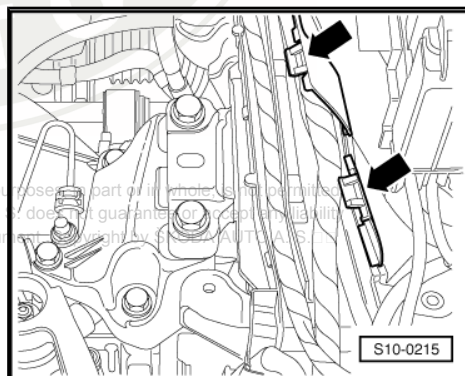
- Disconnect the plug -1- from the thermal switch and the radiator fan.
- Disconnect the plug of the engine wiring harness from the engine control unit (front plug) ➔ [page 192](#) .



- Release guide for engine wiring harness and pull out upwards -arrow-.



- Open all fuses for the engine wiring harness at frame side rail -arrows-.
- Open other attachments of the engine wiring harness, remove engine wiring harness and attach to engine.
- Attach the cables with a cable strap at the engine.



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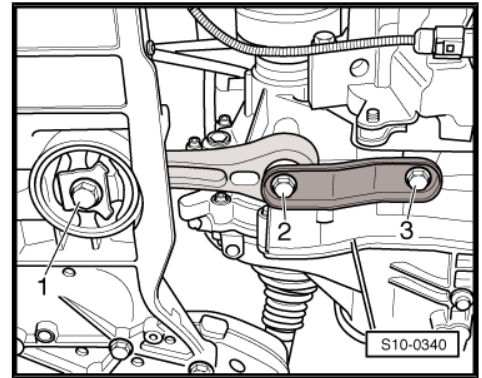
- First of all release the screw -1-.
- Then release the screws -2- and -3- and remove the pendulum support.

For vehicles with automatic gearbox DSG

- Remove the selector lever control cable from the gearbox ⇒ Gearbox; Rep. Gr. 34 .

For vehicles with manual gearbox

- Unscrew shift mechanism from gearbox ⇒ Manual Gearbox; Rep. Gr. 34 .
- Remove the slave cylinder of the hydraulic clutch ⇒ Manual Gearbox; Rep. Gr. 30 and tie up to the side. Do not open line system.

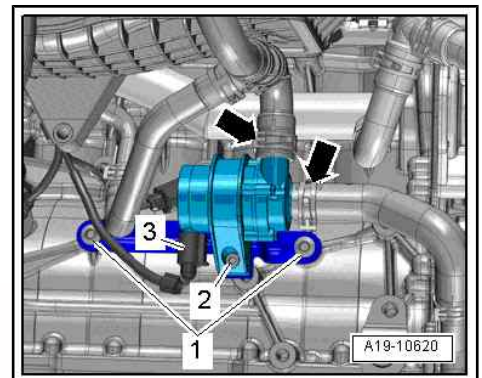


Caution

After removing the slave cylinder, do not operate the clutch pedal. The slave cylinder can be removed in this way.

Continued for all vehicles

- Put lock carrier in service position ⇒ Body Work; Rep. Gr. 50 .
- Disconnect the plug -3- from the coolant recirculation pump -V50- .
- Slacken the spring strap clamps -arrows- and detach the coolant hoses.
- Release fixing screw -2- and remove the pump from the bracket.
- Unscrew screws -1- of bracket for coolant recirculation pump -V50- from the cylinder block.



Vehicles with air conditioning

- Remove V-ribbed belt ⇒ [page 27](#) .
- Disconnect plug -1- for regulating valve at AC compressor.



WARNING

Risk of injury through refrigerant.

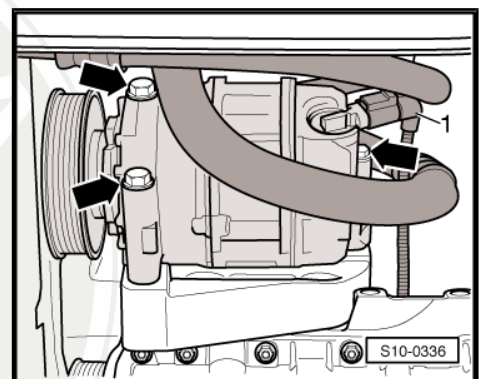
- ◆ *Do not open the refrigerant circuit of the air conditioning system.*



Caution

Risk of damaging refrigerant lines and hoses.

- ◆ *Do not twist and kink the refrigerant lines and hoses.*

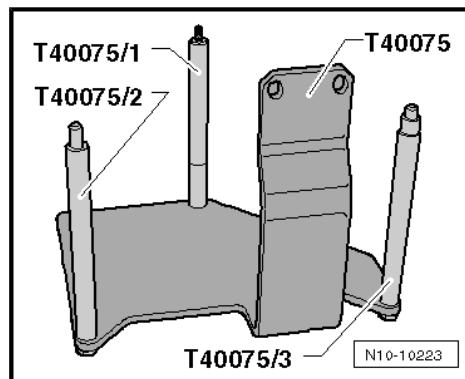


- Release screws -arrows- for AC compressor.
- Attach AC compressor to lock carrier.

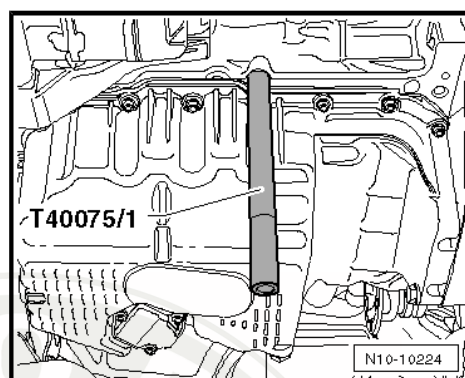
Continued for all vehicles

In order to lower the engine with the gearbox, the engine holder -T40075A- with the adapters -/1-, -/2- and -/3- is required.

- Turn the adapter -T40075/1- up to the stop in the cylinder block.

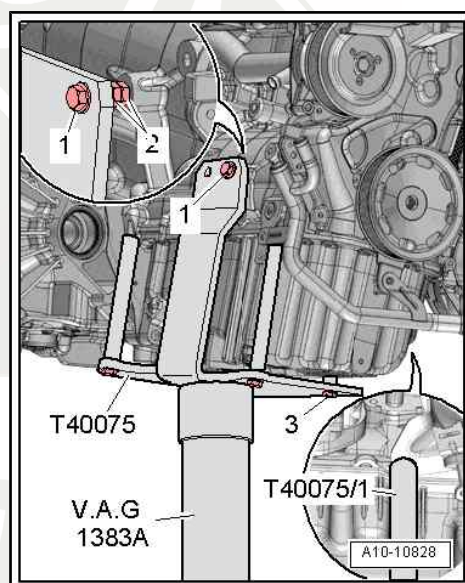


- Fit the engine mount -T40075A- with the adapters -/2- and -/3- to the cylinder block and screw down the adapter -T40075/1- with screw -3-.
- Slide two nuts M10 -2- between the cylinder block and the engine mount -T40075A- .
- Attach the engine holder -T40075A- with a screw M8x35 -1- by hand at the cylinder block.
- Tighten all screws on the engine mount -T40075A- to 20 Nm.
- Slightly raise the engine and gearbox with the engine/gearbox jack -V.A.G 1383 A- .



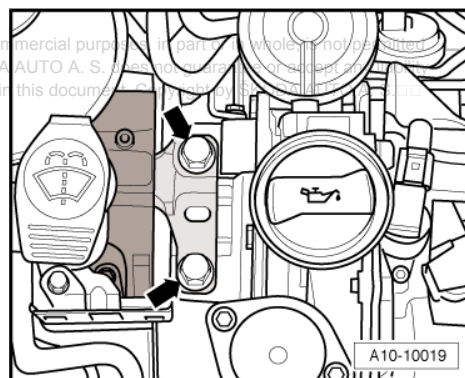
i Note

- ◆ Check whether all hose and line connections between engine, gearbox and body are released.
- ◆ Use the double ladder -VAS 5085- for removing the fixing bolts.



- Unscrew the assembly bracket attached to the engine side from above -arrows-.

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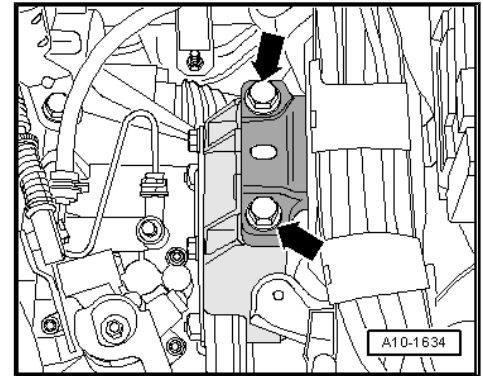




- Unscrew the assembly bracket attached to the gearbox side from above -arrows-.

i Note

- ◆ *The engine/gearbox assembly should be lowered with the help of a second mechanic.*
- ◆ *When lowering carefully guide the engine/gearbox assembly, in order to avoid damage.*
- Pull engine/gearbox unit as far forward as possible and lower slowly downwards.



1.3 Securing the engine to the assembly stand

Special tools and workshop equipment required

- ◆ Lifting device -MP 9-201 (2024 A)-
- ◆ Engine mount -MP 1-202-
- ◆ Assembly stand -MP 9-101-
- ◆ Workshop crane

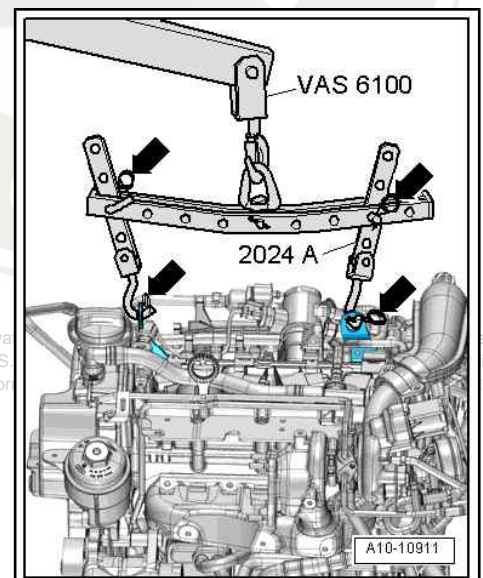
Secure the engine with engine mount -MP 1-202- on the assembly stand -MP 9-101- before performing assembly work.

- Guide engine with gearbox using the engine/gearbox jack - V.A.G 1383 A- onto a work bench.
- Lower the engine/gearbox unit in such a way that the gearbox is positioned on the support.
- Remove engine/gearbox connecting screws.
- Press gearbox from engine.
- Hook on the lifting device -2024 A- as shown and raise with the workshop crane from the engine/gearbox jack -V.A.G 1383 A- .



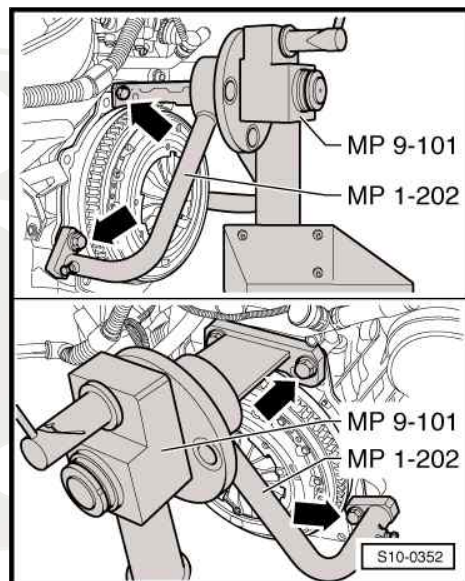
WARNING

Use securing pins on the hooks and rig pins -arrows-, in order to avoid injuries and damages to the engine.



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- Screw engine mount -MP 1-202- to engine and to assembly stand -MP 9-101- .



1.4 Installing the engine

Special tools and workshop equipment required

- ◆ Double ladder , e. g. -VAS 5085 -
- ◆ Pliers for spring strap clamps
- ◆ Grease -G 000 100-
- ◆ Cable strap
- Fit engine and gearbox using engine mount to the engine/ gearbox jack .

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Work procedure

Installation is carried out in the reverse order. Pay attention to the following:



Caution

When undertaking all assembly work, particularly in the engine compartment due to its cramped construction, please observe the following:

- ◆ *Lay lines of all kinds (e.g. for fuel, hydraulic fluid, the active charcoal container-unit, cooling fluid and refrigerant, brake fluid, vacuum) and electrical lines in such a way that the original line guide is re-established.*
- ◆ *In order to avoid damage to the cables, ensure that there is adequate free access to all moving or hot components.*



Note

- ◆ *All cable straps should be fitted on again in the same place when installing.*
- ◆ *Secure all hose connections with hose clamps ⇒ Electronic Catalogue of Original Parts .*
- ◆ *When performing installation work replace the self-locking nuts and screws.*
- ◆ *Replace screws which have been tightened to a torquing angle as well as gasket rings and seals.*

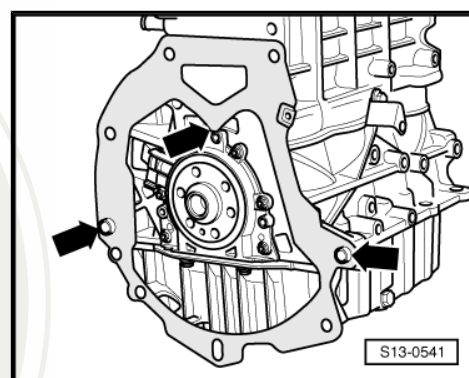
Observe all safety measures and notes for assembly work on the fuel, injection and ignition system and the charge air system as well as rules for cleanliness ⇒ [page 3](#) .

- Ensure that the intermediate plate has been inserted on the sealing flange and is pushed onto the dowel sleeves -arrows-.

For vehicles with manual gearbox

- Check the centering of the clutch disc ⇒ Manual Gearbox; Rep. Gr. 30 .
- Inspect clutch release bearing for wear, replace if necessary.
- Check and install clutch and clutch control
- Lightly lubricate the drive shaft serration with grease -G 000 100- .

For vehicles with automatic gearbox DSG



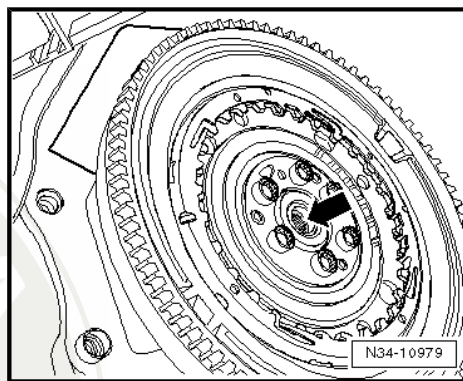
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- Replace the needle bearing -arrow- in the crankshaft
⇒ [page 50](#) .
- Attach the selector lever control cable at the gearbox ⇒ Gear-
box; Rep. Gr. 34 .

Continued for all vehicles

- Screw on gearbox to engine ⇒ [page 21](#) .
- When installing the engine/gearbox unit, ensure clearance to
the assembly carrier, AC compressor as well as to the radiator
fans.
- Tighten the new screws by hand for attaching the engine/
gearbox unit at the engine and gearbox mounts.
- Adjust assembly bracket ⇒ [page 23](#) and tighten screws
⇒ [page 22](#) .



Note

*When setting the assembly bracket for engine/gearbox unit, do
not support it with the supporting device -MP9-200 (10-222A)- .*

- Install pendulum support ⇒ [page 22](#) .
- Install drive shafts ⇒ Chassis; Rep. Gr. 40 .
- Install AC compressor ⇒ [page 26](#) .
- Install the V-ribbed belt ⇒ [page 27](#) .
- Install slave cylinder ⇒ Manual Gearbox; Rep. Gr. 30 .
- Attach shift mechanism and adjust if necessary ⇒ Manual
Gearbox; Rep. Gr. 34 .
- Install the engine wiring harness and connect to the engine
control unit ⇒ [page 192](#) .
- Install exhaust system ⇒ [page 194](#) .
- Install the battery and pay attention to the necessary work after
re-connecting the battery ⇒ Electrical System; Rep. Gr. 27 .
- Checking the oil level ⇒ Maintenance ; Octavia II .
- Top up and bleed cooling system ⇒ [page 103](#) .
- Interrogate all fault memories and delete all fault entries, which
are caused by removing and installing the engine ⇒ Vehicle
diagnosis, testing and information system VAS 5051.
After deleting the fault memory of the engine control unit the
readiness code must be re-generated.
- Perform a test drive.
- Then perform a vehicle system test and if necessary eliminate
the resulting faults.



Tightening torques

Component		Nm
Screws/nuts	M6	9
	M7	13
	M8	20
	M10	40
	M12	70
deviations:		
Engine/gearbox connecting screws ⇒ Gearbox; Rep. Gr. 34		
Screws for assembly bracket ⇒ page 22		



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2 Assembly bracket

2.1 Unit mounting - summary of components

1 - Gearbox support bracket

2 - Screw

- ☐ Tightening torque ⇒
Manual Gearbox; Rep.
Gr. 34

3 - Engine mounting

4 - 40 Nm + torque a further 90°
(1/4 turn)

- ☐ replace

5 - Bracket for activated charcoal filter

6 - 9 Nm

7 - 9 Nm

8 - 20 Nm + torque a further 90°
(1/4 turn)

- ☐ replace

9 - 20 Nm + torque a further 90°
(1/4 turn)

- ☐ replace

10 - Connecting part

11 - 40 Nm + torque a further 90°
(1/4 turn)

- ☐ replace

12 - 60 Nm + torque a further 90°
(1/4 turn)

- ☐ replace

13 - Pendulum support

- ☐ Removing: First remove
screw -14-, then screws -15-

- ☐ Installing: First tighten screws -15-, then screw -14-.

14 - 100 Nm + torque a further 90° (1/4 turn)

- ☐ replace

15 - Screws

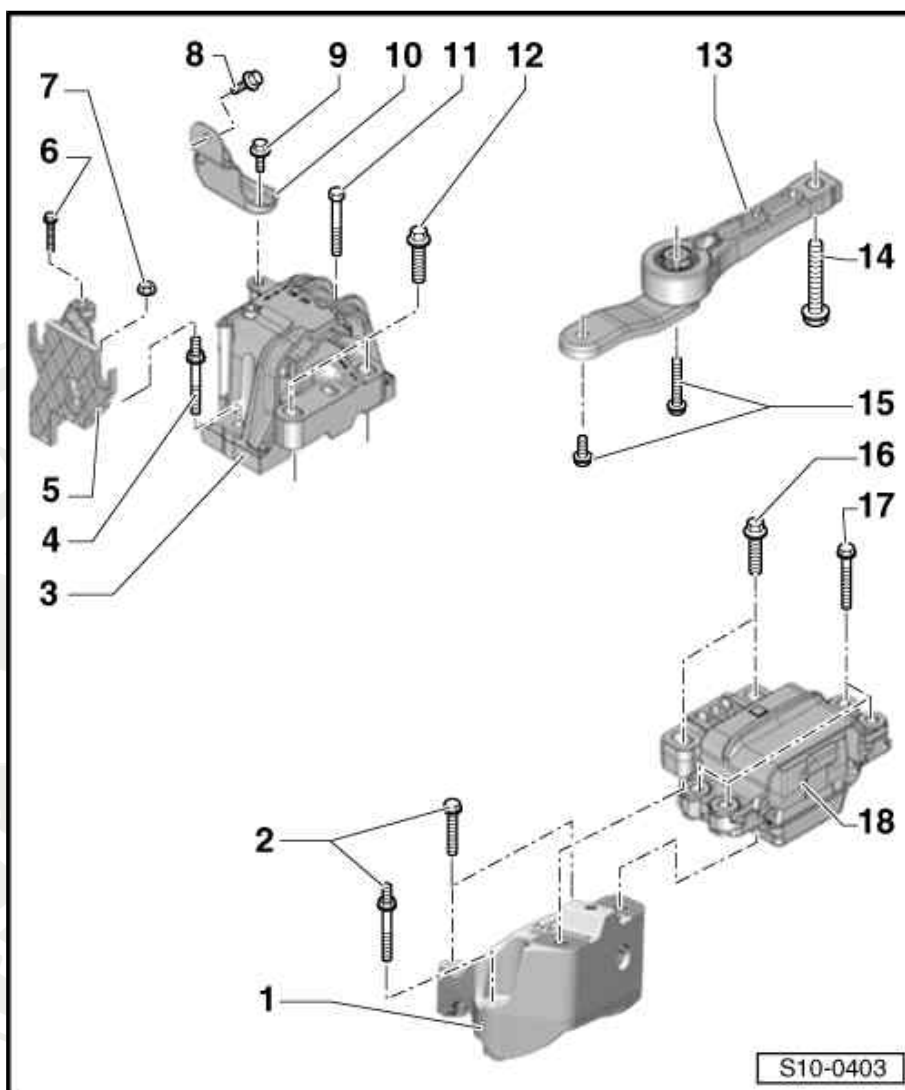
- ☐ replace
- ☐ Grade 8.8 = 40 Nm + torque a further + 90° (1/4 turn)
- ☐ Grade 10.9 = 50 Nm + torque a further + 90° (1/4 turn)

16 - 60 Nm + torque a further 90° (1/4 turn)

- ☐ replace

17 - 40 Nm + torque a further 90° (1/4 turn)

- ☐ replace



S10-0403



18 - Gearbox mount

2.2 Checking and adjusting the assembly bracket

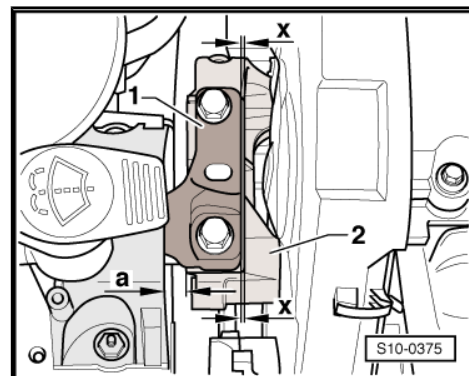
2.2.1 Checking the assembly bracket

- Check dimensions on the right hanger for engine/gearbox unit:
- Between engine bracket and engine support there must be a distance -a- = 10 mm.
- The cast iron edge on the engine support -2- must be parallel to the supporting arm -1- the dimension -x- must be the same at the front and rear.



Note

The distance -a- can also be checked e.g. with corresponding round bars.



Only if there is an acoustic complaint (engine or gearbox knock on the frame side rail when cornering) and the dimension -a- is not 10 mm:

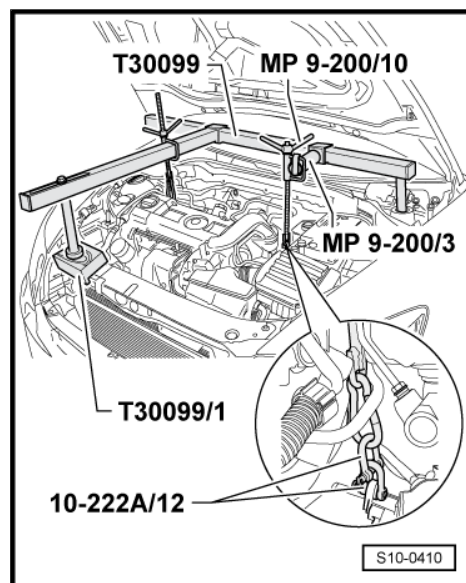
- Adjusting assembly bearing ⇒ [page 23](#) .

2.2.2 Adjusting the unit mounting

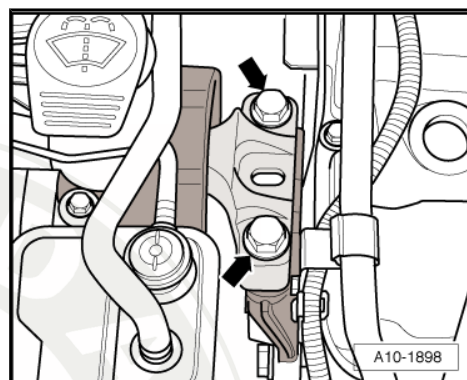
Special tools and workshop equipment required

- ◆ Supporting device -T30099-
- ◆ Base -T30099/1-
- ◆ Adapter -MP9-200/3 (10-222A/3)-
- ◆ Lifting eye -10-222A/12-
- ◆ Snap hook
- Remove battery and battery tray ⇒ Electrical System; Rep. Gr. 27 .
- Remove the cooling water tank cover ⇒ Body Work; Rep. Gr. 66 .

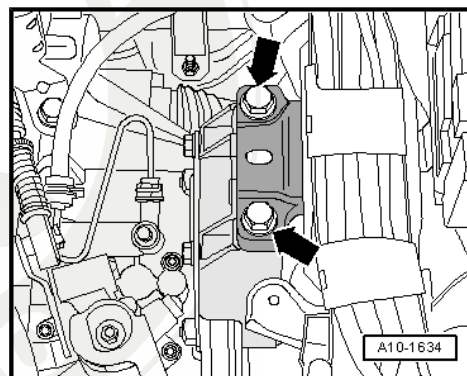
- Install supporting device -T30099- and support engine in fitting position.
- Uniformly pre-tension the engine/gearbox unit with both spindles, but do not raise.



- Release the screws -arrows- of the assembly bracket at the engine.



- Slightly loosen the screws -arrows- of the assembly bracket at the gearbox (less than 1 revolution).
- Successively replace all the screws of the assembly bracket (as long as it has not already been performed when installing the engine) and insert these loosely.



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- Move the engine/gearbox unit with an assembly lever between engine support -2- and supporting arm -1- for engine mount until the following dimensions are set:
- Between engine bracket and engine support there must be a distance -a- of 10 mm.
- The cast iron edge on the engine support -2- must be parallel to the supporting arm -1- the dimension -x- must be the same at the front and rear.

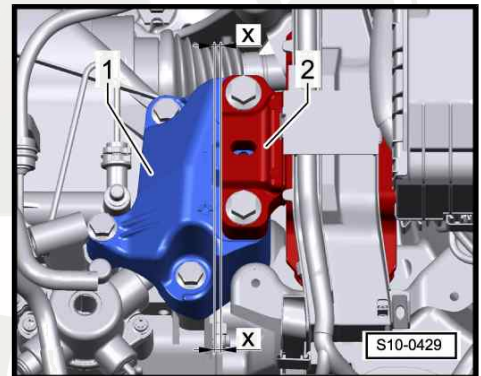
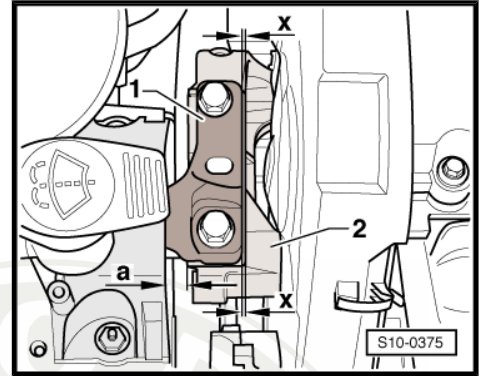


Note

The distance -a- = 10 mm can be checked e.g. with suitable round bars.

- Tighten the screws for the engine side assembly bracket
⇒ [page 22](#) .
- Make sure that on the gearbox side the edges of the supporting arm -2- and gearbox support -1- are parallel.
- The dimension -x- must be the same on both mount sides.
- Tighten the screws for the gearbox side assembly bracket
⇒ [page 22](#) .

Further installation occurs in reverse order.



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13 – Crankgear

1 V-ribbed belt drive

1.1 V-ribbed belt drive - Summary of components for vehicles with air conditioning system

1 - V-ribbed belt

- ☐ mark the direction of rotation with chalk or a felt-tip pen before removing
- ☐ check for wear
- ☐ do not kink
- ☐ removing and installing ➔ [page 27](#)

2 - 150 Nm + torque a further 180° (1/2 turn)

- ☐ replace
- ☐ removing and installing ➔ ["3.4 Removing and installing crankshaft-belt pulley", page 40](#)
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ Secure belt pulley with counterholder -T30004 (3415)- to prevent it from turning

3 - Crankshaft-belt pulley

- ☐ Clamping surfaces must be free of oil and grease.

4 - Bushing

- ☐ Clamping surfaces must be free of oil and grease.

5 - O-ring

- ☐ replace

6 - Guide pulley, 40 Nm

7 - 20 Nm

- ☐ When loosening and tightening, counterhold with the wrench for the water pump and power-assisted steering -MP 1-308 (V.A.G 1590)- to this end rework wrench for the water pump and power-assisted steering - MP 1-308 (V.A.G 1590)- ➔ [page 106](#)

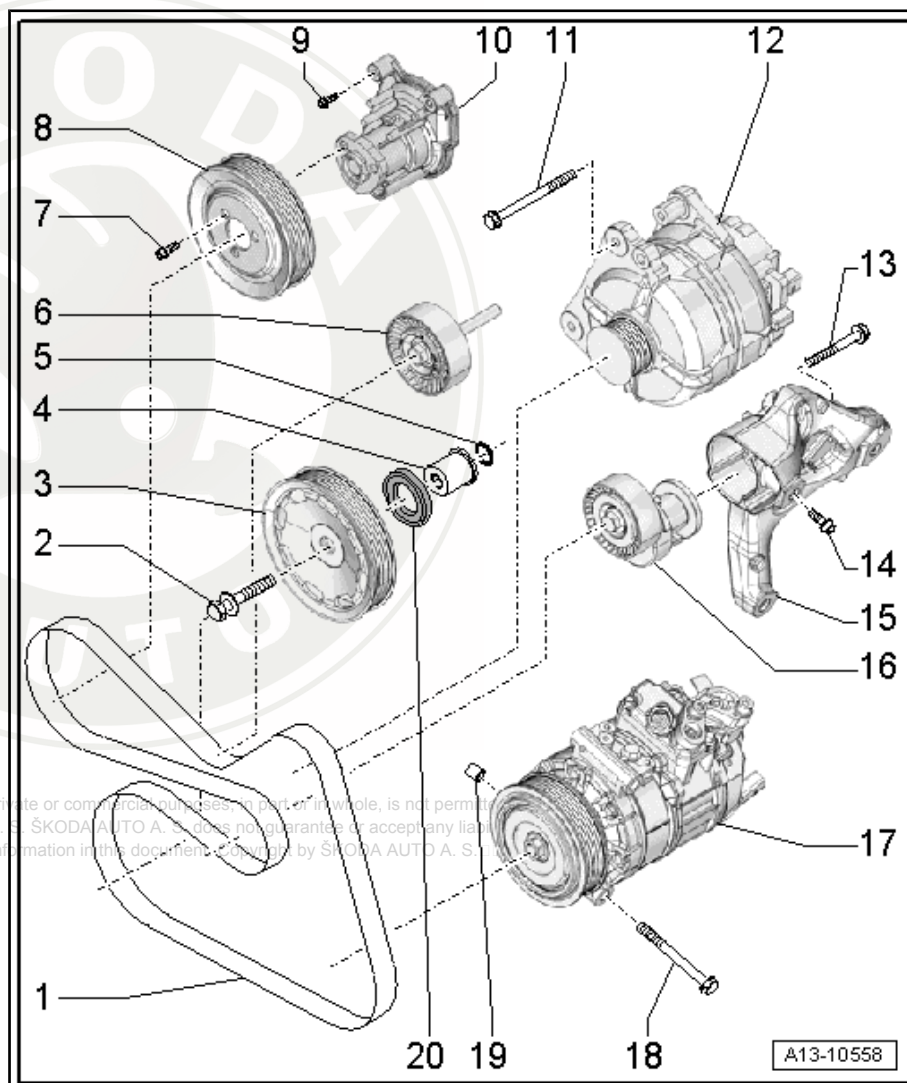
8 - Belt pulley for coolant pump

- ☐ removing and installing ➔ [page 40](#)

9 - 9 Nm

10 - Coolant pump

- ☐ removing and installing ➔ [page 107](#)





11 - 25 Nm

12 - Generator

- ☐ removing and installing ⇒ Electrical System; Rep. Gr. 27
- ☐ to facilitate positioning, drive the threaded bushings for the screws at the generator slightly backwards

13 - 40 Nm + torque a further 90° (1/4 turn)

- ☐ replace

14 - 25 Nm

15 - Bracket for auxiliary units

- ☐ for tensioning device and AC compressor
- ☐ removing and installing ⇒ [page 28](#)

16 - Tensioning device for V-ribbed belt

- ☐ swivel tensioning device for V-ribbed belt with wrench to slacken the V-ribbed belt
- ☐ Secure tensioning device with a 4 mm hexagon wrench
- ☐ to remove, release screw (-Pos. 11-)

17 - AC compressor

- ☐ removing and installing ⇒ Heating, Air Conditioning; Rep. Gr. 87

18 - 25 Nm

19 - Fitting sleeve

20 - Sealing ring

- ☐ replace ⇒ [page 39](#)

1.2 Removing and installing V-ribbed belt

Special tools and workshop equipment required

- ◆ Locking pin -T10060 A-
 - ◆ Ring spanner wrench size 16
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Removing

- Remove the sound dampening system ⇒ Body Work; Rep. Gr. 50 .
- Remove the right wheelhouse liner bottom part ⇒ Body Work; Rep. Gr. 66 .



Caution

Risk of damage through reversing the rotation direction of an already used V-ribbed belt.

- ◆ ***Mark the direction of rotation with chalk or a felt-tip pen for the re-installation before removing the V-ribbed belt.***

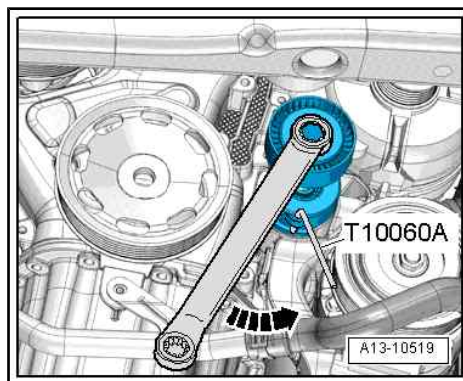
- Loosen the V-ribbed belt by swivelling the tensioning element using the ring spanner SW 16 -in direction of arrow-.
- Interlock the tensioning element with the locking pin -T10060 A- .
- Remove the V-ribbed belt.

Install



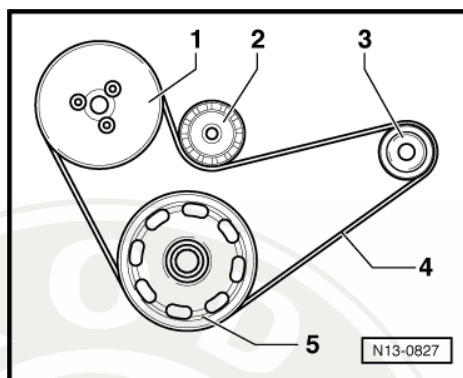
Note

- ♦ *Before fitting the V-ribbed belt make sure that all assemblies (AC generator, AC compressor, coolant pump) are securely mounted.*
- ♦ *Pay attention to the correct position and rotation direction of the V-ribbed belt in the belt pulley when installing it.*
- First lay the V-ribbed belt on the belt pulley of the crankshaft. Then shift the belt onto the tensioning roller.



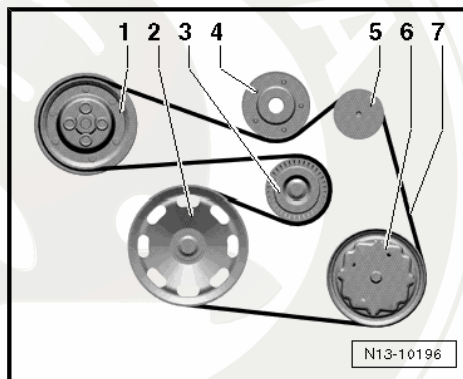
Routing of ribbed V-belt on vehicles without air conditioning system:

- 1 - Coolant pump
- 2 - Tensioning device for V-ribbed belt
- 3 - AC generator
- 4 - V-ribbed belt
- 5 - Crankshaft



Routing of ribbed V-belt on vehicles with air conditioning system:

- 1 - Coolant pump
- 2 - Crankshaft
- 3 - Tensioning device for V-ribbed belt
- 4 - Guide pulley
- 5 - AC generator
- 6 - AC compressor
- 7 - V-ribbed belt



Further installation occurs in a similar way in reverse order to removal.

- Start engine and check ribbed V-belt run.

1.3 Removing and installing the bracket for AC compressor

Removing

- Remove V-ribbed belt ⇒ [page 27](#) .
- Remove the generator ⇒ Electrical System; Rep. Gr. 27 .

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WARNING

Risk of injury through refrigerant.

- ◆ *Do not open the refrigerant circuit of the air conditioning system.*



Caution

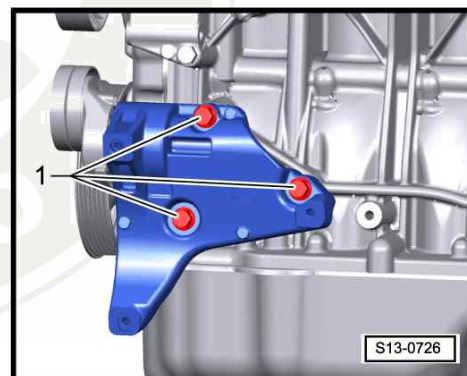
Risk of damaging refrigerant lines and hoses.

- ◆ *Do not twist and kink the refrigerant lines and hoses.*

- Remove AC compressor from the bracket ⇒ [page 26](#) .
- Mount the AC compressor in such a way that the refrigerant lines/hoses are not under tension.
- Unscrew fixing screws -1- and remove holder with tensioning element.

Install

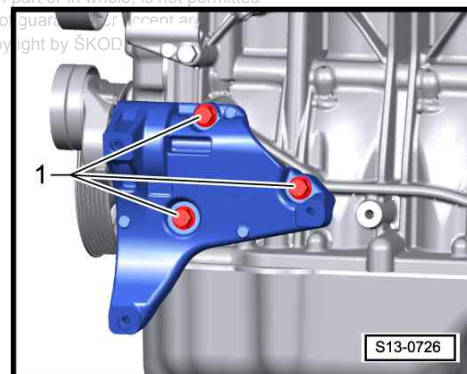
- Fit the bracket for auxiliary units to the cylinder block.



- Tighten fixing screws -1- to 25 Nm.

Tightening torque tensioning element: ⇒ [page 26](#)

Further installation occurs in a similar way in reverse order to removal.



2 Camshaft drive

2.1 Camshaft drive - Summary of components



Note

- ◆ Before assembly oil all bearing and contact surfaces.
- ◆ If considerable quantities of metal swarf or abrasion is found when carrying out engine repairs, this can be subject to damage to the crankshaft and conrod bearings. In order to avoid consequential damage, after the repair perform the following tasks:
 - Carefully clean the oil galleries.
 - Replace oil spray jets.
 - Replace engine oil cooler.
 - Replace oil filter.

1 - Cylinder head with camshaft housing

- ☐ removing and installing
⇒ [page 80](#)
- ☐ Do not rework the sealing surface
- ☐ Camshaft housing with integrated camshaft bearings

2 - Cylinder block

- ☐ Sealing flanges and fly-wheel
⇒ [page 37](#)
- ☐ Pistons and conrods
⇒ [page 52](#)

3 - Bracket for auxiliary units

- ☐ for tensioning device and AC compressor
- ☐ removing and installing
⇒ [page 28](#)

4 - Cap

5 - Sprocket

- ☐ for oil pump drive and timing chain
- ☐ Clamping surfaces must be free of oil and grease.

6 - 20 Nm + torque a further 1/4 turn (90°)

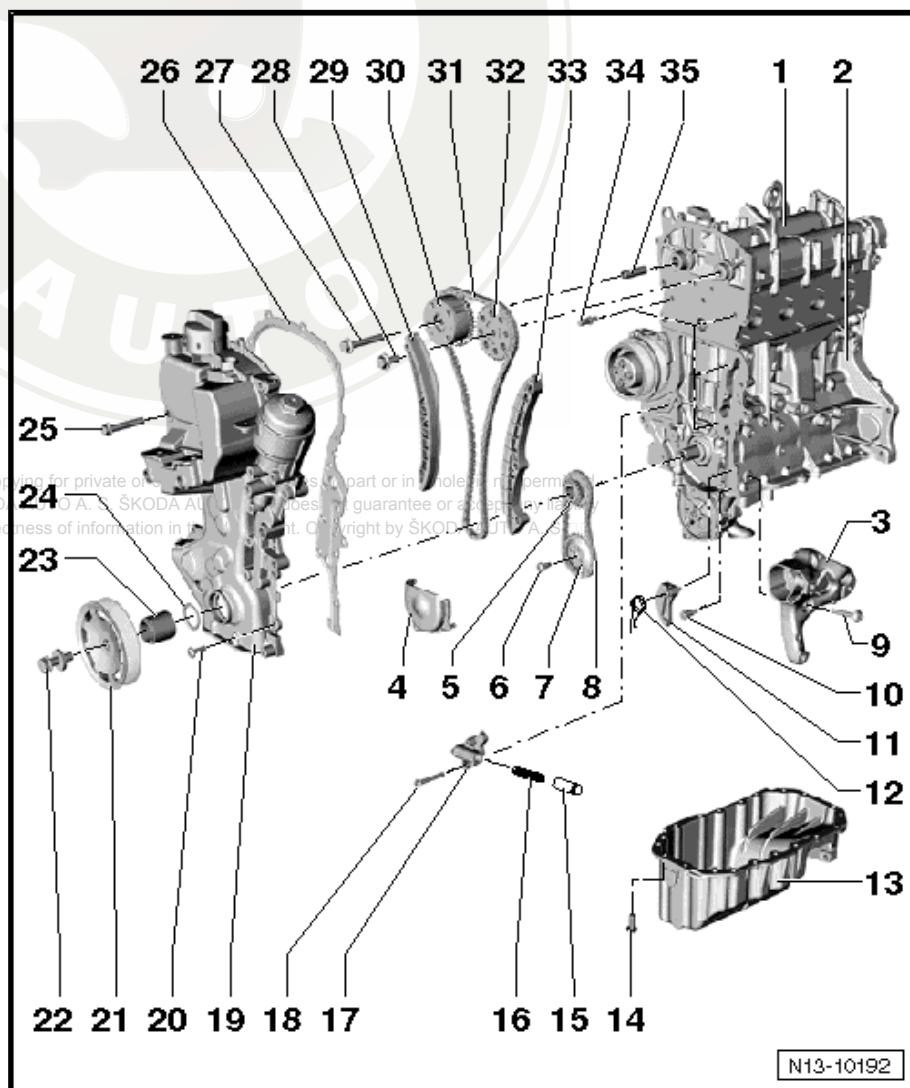
- ☐ replace

7 - Sprocket

- ☐ Counterhold sprocket with counterholder - T10172-

8 - Drive chain

- ☐ mark running direction (installed position) before removing





9 - 25 Nm

10 - 15 Nm

11 - Chain tensioner with tensioning rail

- ☐ for oil pump drive

12 - Tensioning spring

13 - Oil pan

- ☐ removing and installing ⇒ [page 95](#)
- ☐ clean sealing surface before installing
- ☐ fit with silicone sealant D 176 404 A2

14 - 15 Nm

15 - Piston

- ☐ for chain sprocket of drive chain

16 - Pressure spring

17 - Chain tensioner

18 - 9 Nm

19 - Timing case

- ☐ removing and installing ⇒ [page 32](#)
- ☐ additionally fit with sealant D 176 501 A1

20 - 10 Nm

21 - Belt pulley

- ☐ removing and installing ⇒ [page 40](#)
- ☐ Clamping surfaces must be free of oil and grease.
- ☐ Secure belt pulley with counterholder -T30004 (3415)- to prevent it from turning
- ☐ Removing and installing ribbed V-belt ⇒ [page 27](#)

22 - 150 Nm + torque a further 180° (1/2 turn)

- ☐ replace
- ☐ removing and installing ⇒ ["3.4 Removing and installing crankshaft-belt pulley", page 40](#)
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ Secure belt pulley with counterholder -T30004 (3415)- to prevent it from turning

23 - Bushing

- ☐ Clamping surfaces must be free of oil and grease.

24 - O-ring

- ☐ replace

25 - 50 Nm

26 - Gasket

27 - 40 Nm + torque a further 1/4 turn (90°)

- ☐ Counterhold camshaft adjuster with counterholder - T10172-
- ☐ Screw with left-hand thread
- ☐ replace

28 - 50 Nm + torque a further 1/4 turn (90°)

- ☐ replace



29 - Tensioning rail

30 - Camshaft adjuster

- ☐ removing and installing ⇒ [page 67](#) and ⇒ [page 61](#)
- ☐ must not be disassembled

31 - Timing chain

- ☐ removing and installing ⇒ [page 67](#)

32 - Sprocket

- ☐ removing and installing ⇒ [page 67](#)
- ☐ for exhaust camshaft

33 - Sliding rail

- ☐ for timing chain

34 - Guide bolt

- ☐ Tightening torque: 20 Nm

35 - Bushing

2.2 Removing and installing the timing case

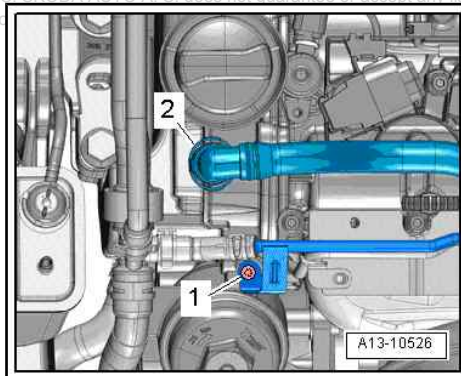
Special tools and workshop equipment required

- ◆ Supporting device -T30099-
- ◆ Base -T30099/1-
- ◆ Counterholder -T30004 (3415)-
- ◆ Bolt -T30004/1 (3415/1)-
- ◆ Sealant -D 176 501 A1-
- ◆ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-

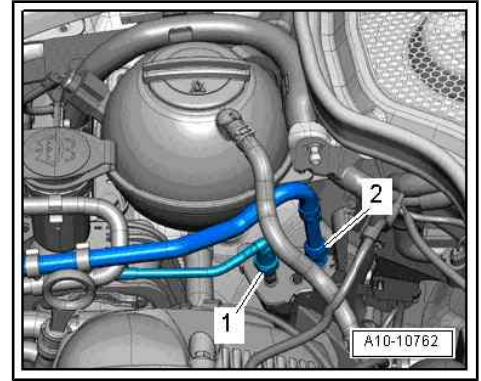
Removing

- Remove engine cover ⇒ [page 9](#) .
- Release screw -1- for coolant line.
- Remove hose -2- for crankcase ventilation from the cover for timing chain, to do so press in the circlip.

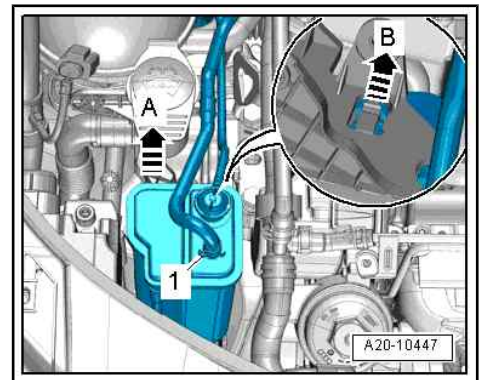
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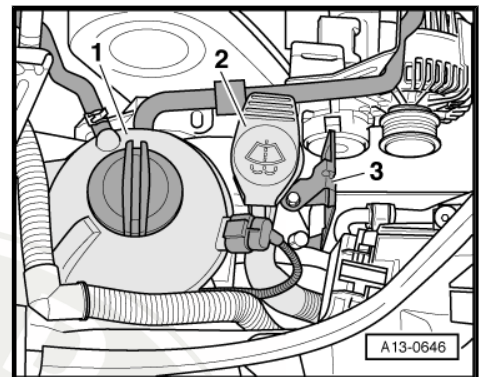
- Disconnect the vent line -1-. To do so press in the securing ring.



- Detach the bleeder hose -1- to the intake manifold at the activated charcoal filter.
- Release the activated charcoal filter -arrow B- and remove the activated charcoal filter with bracket upwards -arrow A-.



- Unbolt bracket -3- for activated charcoal filter.
- Release screw on filler neck -2- for windshield washer fluid reservoir.
- Disconnect plug from switch for coolant shortage warning light -F66- at coolant expansion reservoir and expose electrical wiring loom.
- Unscrew screws for coolant expansion reservoir -1-; place coolant expansion reservoir with connected hoses on the engine and if necessary fasten.
- Remove V-ribbed belt ⇒ [page 27](#) .
- Remove belt pulley from the coolant pump ⇒ [page 106](#) .



- Disconnect plug -1- for regulating valve at AC compressor.



WARNING

Risk of injury through refrigerant.

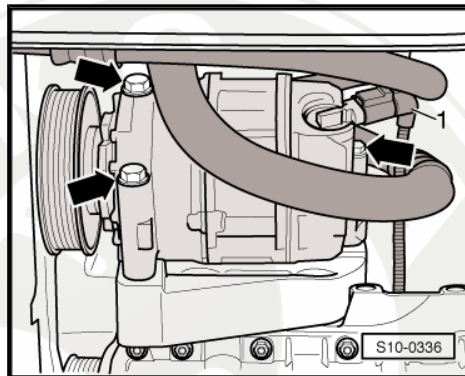
- ◆ *Do not open the refrigerant circuit of the air conditioning system.*



Caution

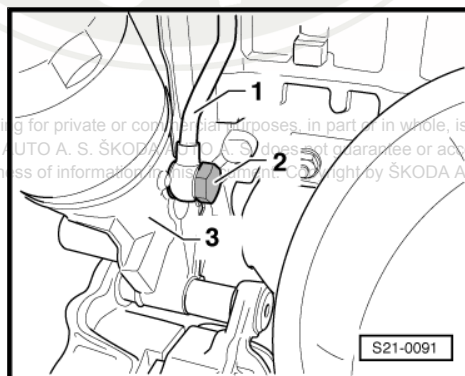
Risk of damaging refrigerant lines and hoses.

- ◆ *Do not twist and kink the refrigerant lines and hoses.*



- Release screws -arrows- for AC compressor.
- Attach AC compressor to lock carrier.
- Remove the bracket for auxiliary units ➔ [page 28](#) .
- Unscrew the hollow screw -2- of the oil feed line -1- for the exhaust gas turbocharger out of the timing case -3-.

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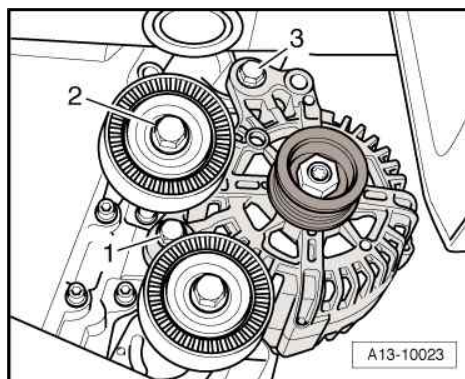
- Remove AC generator and guide pulley -2- ➔ Electrical System; Rep. Gr. 27 .
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1 ➔ [page 58](#) .
- Remove crankshaft-belt pulley ➔ [page 40](#) .



Caution

Risk of engine damage.

- ◆ *In order to avoid that the chain sprocket on the crankshaft slides out of the driver, the crankshaft must not be turned when the V-ribbed belt pulley is released.*



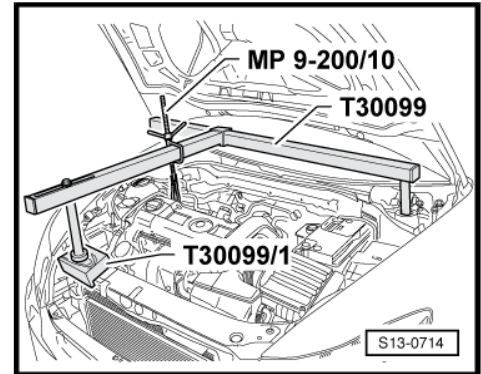
- Removing the oil pan ➔ [page 95](#) .



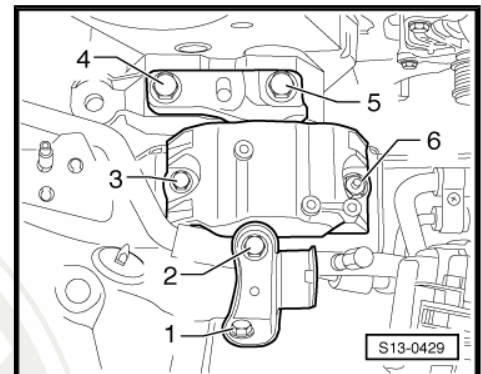
Note

If the timing case is only removed in order to disassemble the cylinder head, the mounting of the engine as described in the following is not carried out, yet the mount described for the disassembly of the cylinder head is used.

- Install the supporting device -T30099- as shown and support the engine in its installed position.
- Slightly pre-tension the engine.



- Release screws -1...6- and remove engine mounting.



- Release the Allen screws -1...6- of the timing case and the screws marked with the -arrows-.
- Remove timing case. To do so if necessary slightly raise engine.

i Note

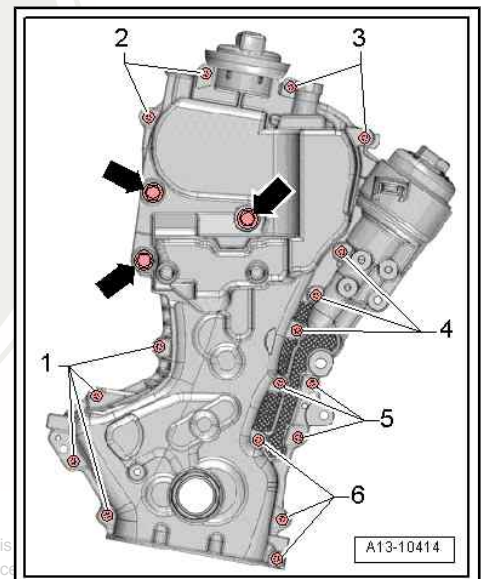
Make sure that the bushing for the crankshaft remains in the timing case.

- Drive gasket ring for crankshaft out of the timing case.

Install

i Note

Observe that the clamping surfaces of the belt pulley, the fixing screw, the bushing and the crankshaft chain sprocket are free of oil and grease.

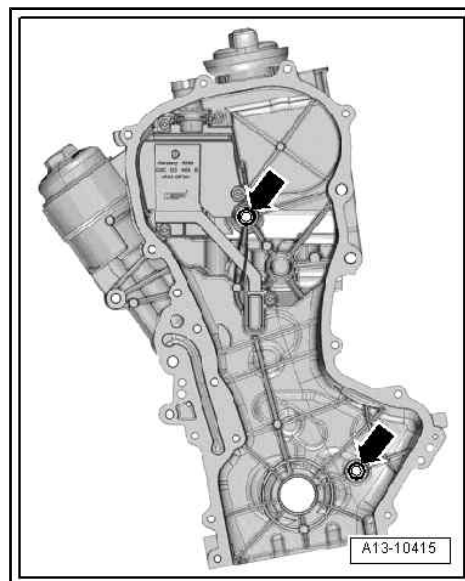


WARNING

Wear protective gloves when working with sealant and grease remover!

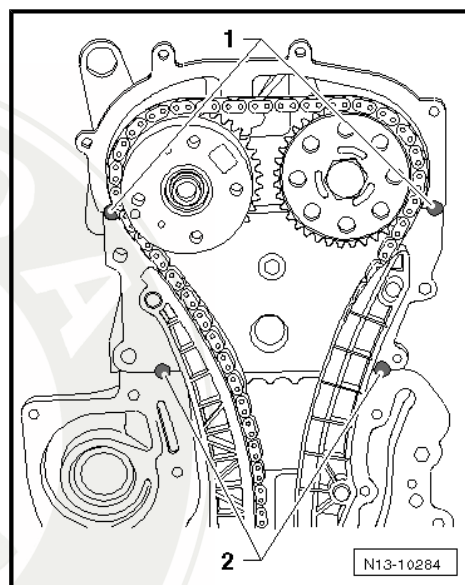
- Remove residual sealant on the sealing surfaces with chemical sealant remover.
- Degrease the sealing surfaces.

- Insert new gasket rings -arrows- onto the reverse side of the timing case.



Note

- ◆ Furthermore, the timing case is sealed to the engine with a seal and additionally with the sealant D 176 501 A1.
 - ◆ The sealant D 176 501 A1 should prevent leaks between the timing case and the joints -1- and -2-.
 - ◆ The sealant points must have a diameter of 10 mm and must be approx. 1 mm thick.
 - ◆ Only apply the sealant immediately before installing the timing case.
- Apply the sealant D 176 501 A1 onto the joints of the camshaft housing/cylinder head -1- and the cylinder head/cylinder block -2-.
 - Carefully place the new gasket onto the dowel pins.
 - For better guidance, screw two studs - M6x80- into the cylinder head and the cylinder block.
 - Position the timing case with bushing for crankshaft simultaneously onto the studs, the dowel pins and the crankshaft stud.
 - Tighten diagonally and evenly the fixing screws of the timing case.



Make sure that the timing case does not tilt.

Tightening torques:

Screw M6 - 10 Nm
Screw M10 - 50 Nm

- Adjust engine mounting ➔ [page 23](#) .
- Install the gasket ring for the crankshaft - on the belt pulley side ➔ [page 39](#) .
- Install crankshaft belt pulley ➔ [page 40](#) .
- Attach the oil feed line for the exhaust gas turbocharger to the timing case ➔ [page 147](#) .

Further installation occurs in a similar way in reverse order to removal.

3 Sealing flanges and flywheel

3.1 Summary of components



Repairing the clutch ⇒ Manual Gearbox ; Rep. Gr. 30 .

1 - 150 Nm + torque a further 180° (1/2 turn)

- ☐ replace
- ☐ removing and installing
⇒ ["3.4 Removing and installing crankshaft-belt pulley", page 40](#)
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ Secure belt pulley with counterholder -T30004 (3415)- to prevent it from turning

2 - Crankshaft-belt pulley

- ☐ removing and installing
⇒ [page 40](#)
- ☐ Clamping surfaces must be free of oil and grease.

3 - Sealing ring

- ☐ replace ⇒ [page 39](#)

4 - Bushing

- ☐ Clamping surfaces must be free of oil and grease.

5 - O-ring

- ☐ replace
- ☐ in the bushing

6 - Cylinder head

- ☐ removing and installing
⇒ [page 80](#)

7 - 60 Nm + torque a further 1/4 turn (90°)

8 - Flywheel

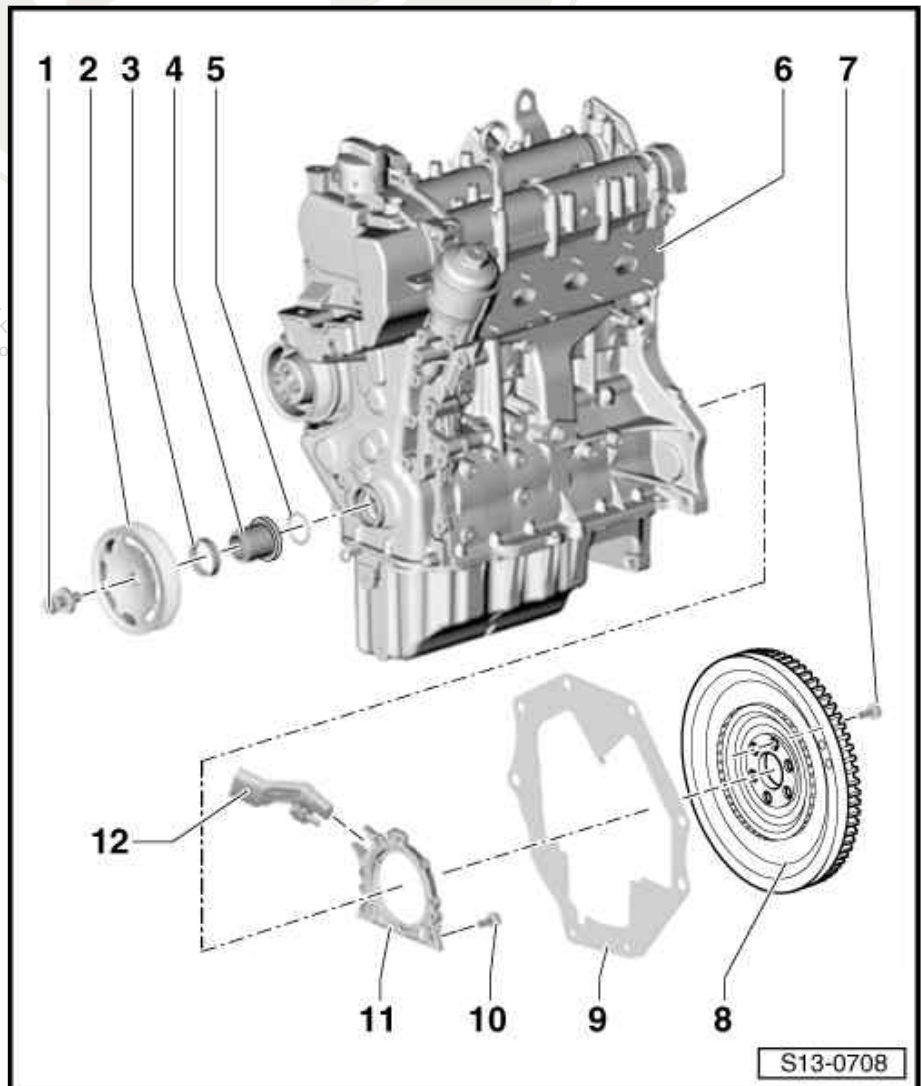
- ☐ on vehicles with automatic gearbox DSG - two-mass flywheel version
- ☐ removing and installing ⇒ [page 38](#)

9 - Intermediate plate

- ☐ must be positioned on dowel sleeves
- ☐ do not damage/bend during assembly work

10 - 10 Nm

- ☐ replace





11 - Sealing flange -on the gearbox side-

- ☐ Only replace sealing flange complete with gasket ring and rotor
- ☐ removing and installing ⇒ [page 43](#)

12 - Engine speed sender -G28- , 5 Nm

- ☐ with captive screw
- ☐ removing and installing ⇒ [page 203](#)

3.2 Removing and installing flywheel

Special tools and workshop equipment required

- ◆ Counterholder -MP1-223 (3067)-

or

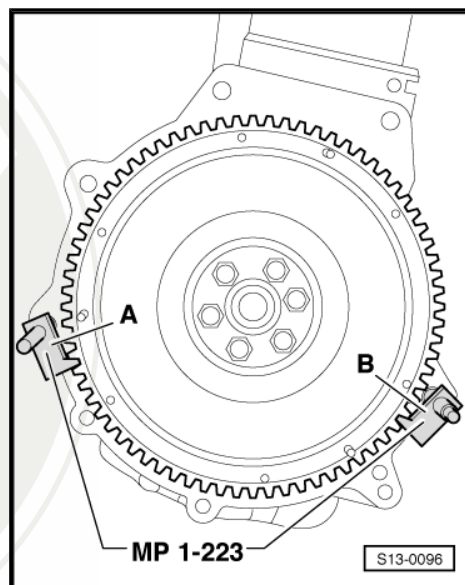
- ◆ Engine mount -MP 1-202 (VW 540)-
- ◆ Bushing -T30010 (VW 540/1B)-
- ◆ Flywheel lock -MP 1-504-

Removing

- Gearbox removed.
- Remove clutch on vehicles with manual gearbox ⇒ Manual Gearbox; Rep. Gr. 30 .

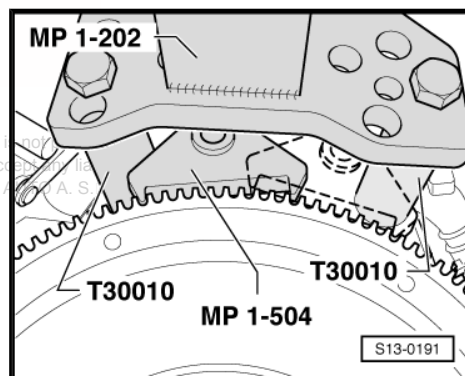
Engine installed

- Insert the counterholder -MP1-223 (3067)- into the bore hole on the cylinder block.
- Fitting position of the counterholder:
 - A - for tightening
 - B - for slackening



Engine removed

- Position the flywheel lock -MP 1-504- on the starter ring gear of the flywheel disk and turn crankshaft until it rests against the sleeve -T30010 - .



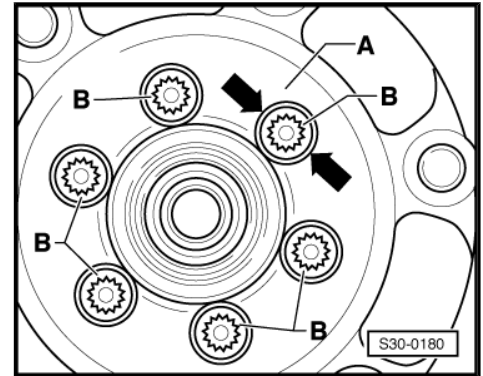
Vehicles with two-mass flywheel

- Rotate the secondary side -A- of the two-mass flywheel in such a way that the screws -B- are positioned in the middle of the holes -arrows-.



Caution

When unscrewing the screws -B-, ensure that no screw head catches on the secondary side -A- of the two-mass flywheel, otherwise it will be damaged.



Continued for all

- Release screws and remove flywheel.

Install

Installation is performed in the reverse order, pay attention to the following points:



Note

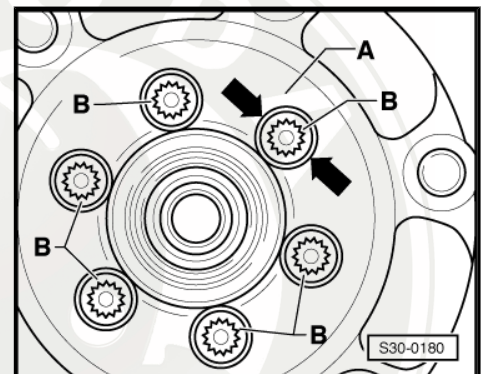
Use new screws for attaching.

Vehicles with two-mass flywheel

- Rotate the secondary side -A- of the two-mass flywheel in such a way that the screws -B- are positioned in the middle of the holes -arrows-.

Continued for all

1. Screw in all the screws by hand.
2. Tighten all the screws crosswise to 60 Nm.
3. Torque all the screws crosswise a further 90° (1/4 turn).



3.3 Replacing gasket ring for crankshaft -on the belt pulley side-

Special tools and workshop equipment required

- ◆ Gasket ring extractor -MP 1-226 (3203)-
- ◆ Assembly device -T10117-

Removing

- Remove V-ribbed belt ⇒ [page 27](#) .
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1 ⇒ [page 58](#) .
- Remove crankshaft-belt pulley ⇒ [page 40](#) .
- Unscrew inner part of the gasket ring extractor -MP 1-226- three turns (approx. 5 mm) out of the outer part and lock with knurled screw.

- Oil the thread head of the gasket ring extractor -MP 1-226- , position and forcefully screw it into the gasket ring as far as possible.
- Release knurled screw and turn the inner side against the crankshaft until the gasket ring is pulled out.
- Remove the bushing from the crankshaft journal and clean the clamping surfaces of the crankshaft chain sprocket and the bushing.

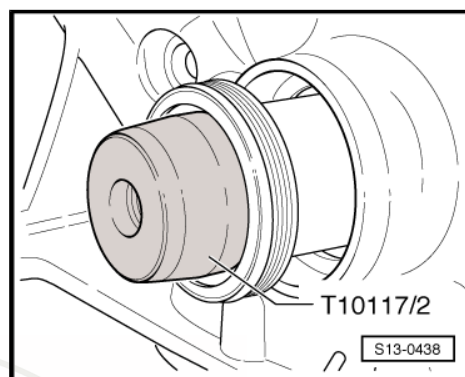
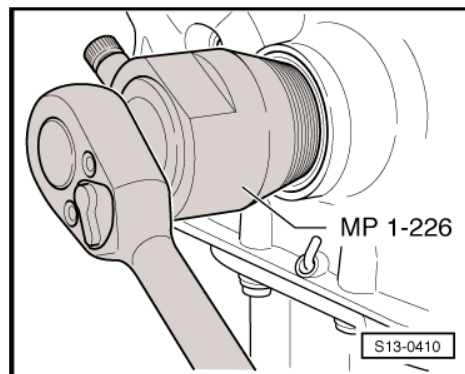
Install



Note

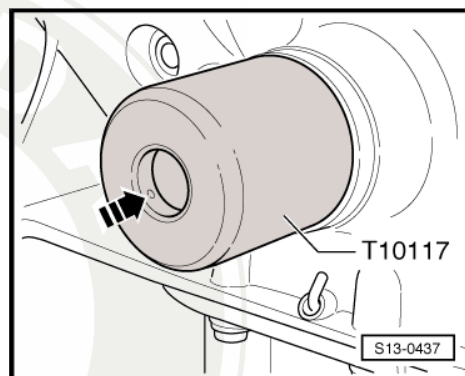
Observe that the clamping surfaces of the belt pulley, the fixing screw, the bushing and the crankshaft chain sprocket are free of oil and grease.

- Replace O-ring in the bushing ⇒ [page 37](#) .
- Push the bushing onto the crankshaft journal.
- Position the sleeve -T10117/2- on the bushing and slide the gasket ring onto the bushing
- Remove the sleeve -T10117/2- from the bushing.



- Press the gasket ring with the assembly device -T10117- by striking uniformly up to the stop in the timing case.
- Install crankshaft belt pulley ⇒ [page 40](#) .

Further installation occurs in a similar way in reverse order to removal.



3.4 Removing and installing crankshaft-belt pulley

Special tools and workshop equipment required

- ◆ Counterholder -T30004 (3415)-
- ◆ Bolt -T30004/1 (3415/1)-
- ◆ Locating screw -T10340-
- ◆ Adapter for dial gauge -T10170- or -T10170 A-
- ◆ Dial gauge , commercially available

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Removing



Note

- ◆ *In order to avoid that the tightening torque of the fixing screw for the crankshaft-belt pulley is inaccurate due to slip, the fixing screw -T10340- must be used in addition to the counterholder -T30004-.*
- ◆ *The crankshaft is only locked in direction of rotation of engine using the fixing screw -T10340-.*

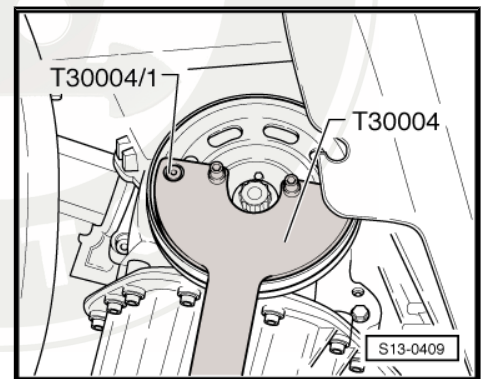


Caution

Risk of engine damage!

- ◆ *The fixing screw -T10340- must not be used to slacken the fixing screw for the crankshaft-belt pulley - only for tightening!*
- ◆ *The locating screw -T10340- must only be screwed in the "TDC" position of the crankshaft.*

- Remove V-ribbed belt ⇒ [page 27](#) .
- Release fixing screw for crankshaft belt pulley.
Counterhold crankshaft belt pulley with counterholder - T30004 - and bolt -T30004/1 - .
- Release fixing screw and remove crankshaft belt pulley.



Caution

Risk of engine damage.

- ◆ *In order to avoid that the chain sprocket on the crankshaft slides out of the driver, the crankshaft must not be turned when the V-ribbed belt pulley is released.*

Install

- Tighten the crankshaft belt pulley by hand with a new fixing screw.

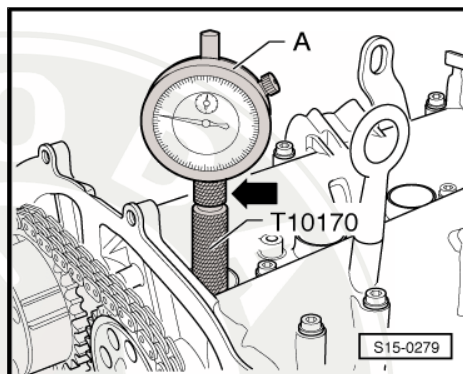


Note

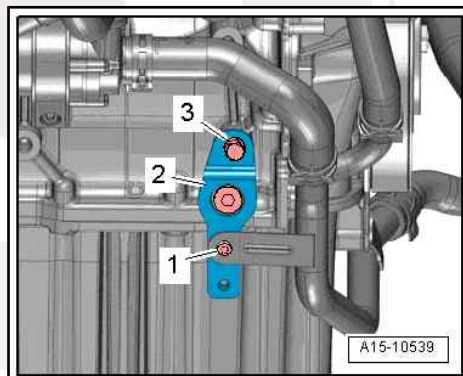
Observe that the clamping surfaces of the fixing screw, the belt pulley and the bushing are free of oil and grease.

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- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1 ➔ [page 58](#) .

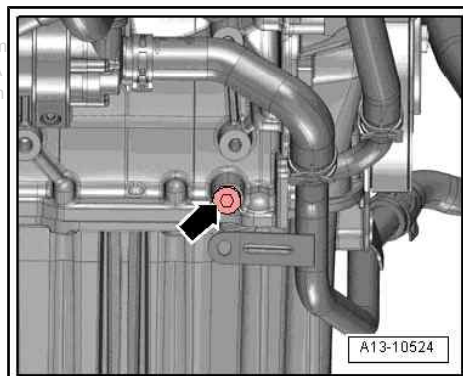


- Unscrew screws -1- (8 Nm) and -3- (40 Nm), remove bracket -2- for right coolant pipe.



- Unscrew screw plug -arrow- for “TDC” bore hole at cylinder block.

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- Turn the fixing screw -T10340- up to the stop in the cylinder block and tighten to 30 Nm.



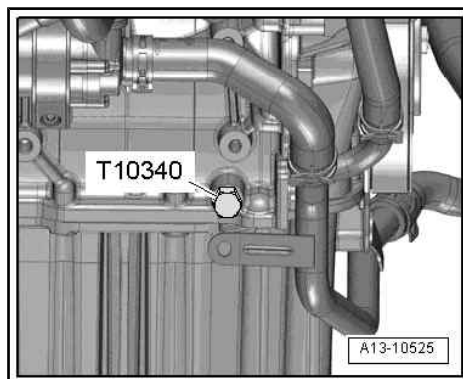
Note

The crankshaft is only locked in direction of rotation of engine with the fixing screw -T10340- .

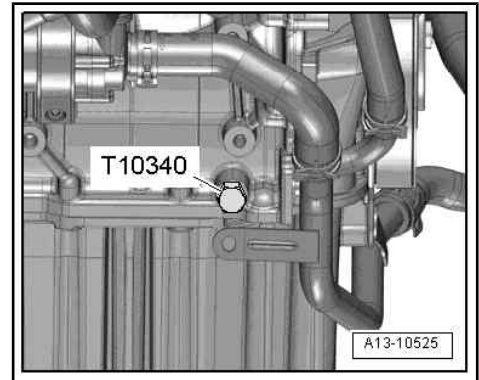
- Tighten the fixing screw for the crankshaft belt pulley.

Tightening torque: 150 Nm + torque a further 1/2 turn (180°)

Counterhold crankshaft belt pulley with counterholder - T30004- and bolt -T30004/1 - .

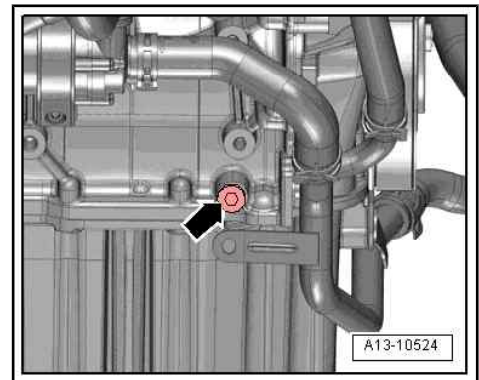


- Unscrew the fixing screw -T10340- from the cylinder block.



- Screw the screw plug -arrow- into the cylinder block.
Tightening torque: 30 Nm
- Install the V-ribbed belt ➔ [page 27](#) .

Further installation occurs in a similar way in reverse order to removal.



3.5 Removing and installing the sealing flange -on the gearbox side-

Special tools and workshop equipment required

- ◆ Assembly device -T10134-

◆ **Feeler gauge** Project information for private or commercial purposes, in part or in whole, is not permitted unless authorised by ŠKODA AUTO A. S. ŠKODA AUTO A. S. does not guarantee or accept any liability for the accuracy of the information in this document. Copyright by ŠKODA AUTO A. S.

- ◆ **Steel straightedge**

- ◆ Screw M6x35 (3x)
- ◆ Screw M7x35 (2x)

3.5.1 Removing

- Gearbox is removed.
- Remove the flywheel.
- Remove intermediate plate.
- Position engine on TDC for cylinder 1 ➔ [page 58](#) (do not remove the screw caps for the camshafts).
- Removing the oil pan ➔ [page 95](#) .

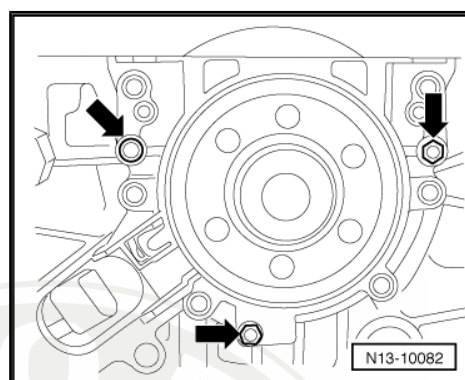
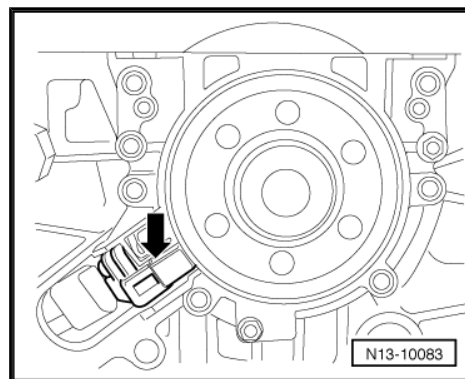
- Remove engine speed sender -G28- -arrow-.
- Unscrew the fixing screws of the sealing flange.



Note

Sealing flange and rotor are pressed together with three M6x35 mm screws from the crankshaft.

- Screw three screws M6x35 into the threaded bores of the sealing flange -arrows-.
- Screw the screws alternately (max $\frac{1}{2}$ turn (180°) per screw) in the sealing flange and press the sealing flange together with the rotor from the crankshaft.



3.5.2 Install



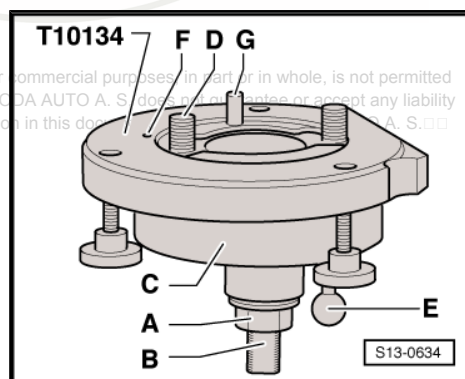
Note

- ♦ *The sealing flange with PTFE gasket ring is provided with sealing lip supporting ring. This supporting ring is intended as an assembly sleeve and must not be removed before installing.*
- ♦ *Do not separate or turn the sealing flange and rotor after removing them from the spare part package.*
- ♦ *The rotor is given its fitting location by fixing the assembly device -T10134- to the positioning pin.*
- ♦ *The sealing flange and gasket ring form one unit and must be replaced together with the rotor.*
- ♦ *The assembly device -T10134- is given its fitting location to the crankshaft by means of a guide bolt, which is guided into a hole of the crankshaft.*

Assembly device -T10134-

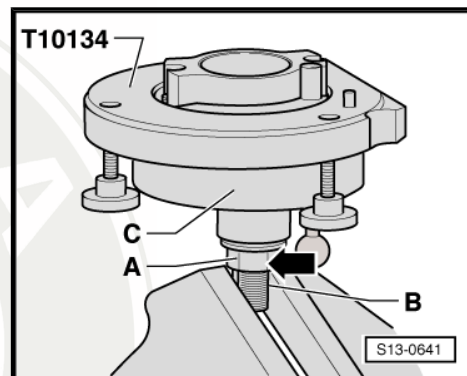
- A - Hexagon nut
- B - Clamping surface
- C - Assembly cup
- D - Allan screw
- E - Guide bolts (with red handle - for fuel engine)
- F - Positioning pin
- G - Guide bolts (with black handle - for diesel engine)

A - Mounting sealing flange with rotor on the assembly device -T10134-



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- Screw the hexagon nut -A- right up to the clamping surface -B- and grip the assembly device -T10134- on the clamping surface -B- of the threaded spindle in a vice.

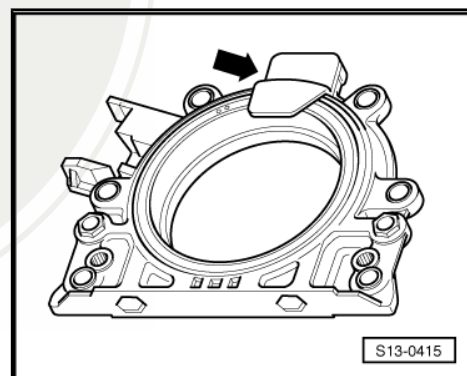


- Remove the securing clip -arrow- from the new sealing flange.



Note

Do not remove or turn the rotor from the sealing flange.



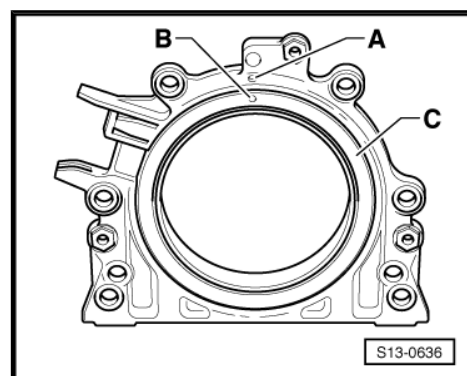
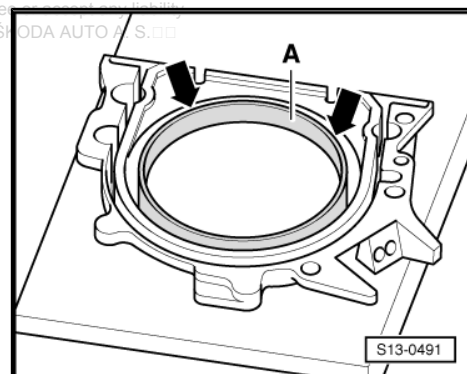
- Lay the front side of the sealing flange on a clean and level surface.
- Press down sealing lips supporting ring -A- in -direction of the arrow-, until it rests on the level surface.



Note

The top side of the rotor and the front side of the sealing flange must be flush.

- The locating hole -B- on the rotor -C- must be flush with the marking -A- on the sealing flange.



- Lay the sealing flange with the front side on the assembly device -T10134- in such a way that the positioning pin -A- engages into the hole -B- of the rotor.



Note

Make sure the sealing flange lies flat on the assembly device.

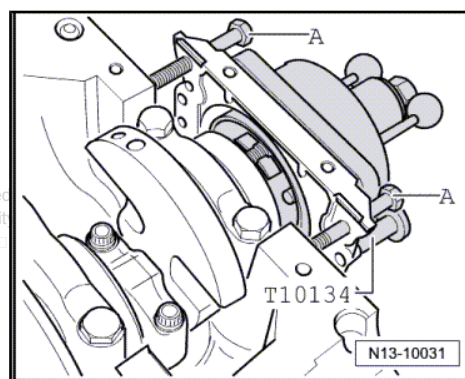
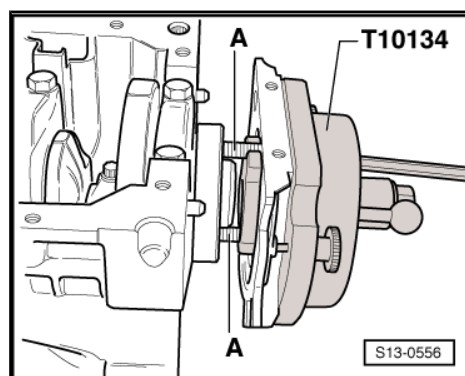
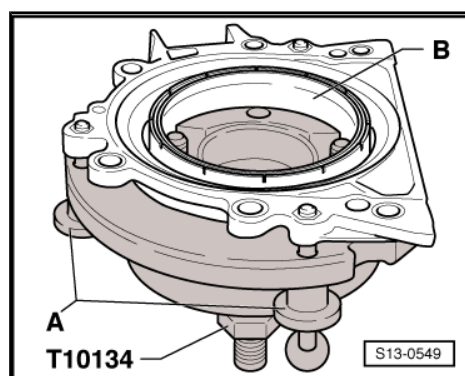
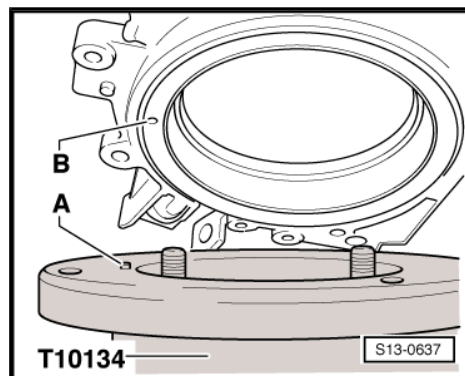
- When tightening the knurled screws -A- press the sealing lip supporting ring -B- on the surface of the assembly device in such a way that the positioning pin cannot slide out of the rotor hole.

B - Mount the assembly device -T10134- on the crankshaft flange

- The crankshaft flange must be free of grease and oil
- Crankshaft is at TDC for cylinder 1
- Unscrew hexagon nut up to the end of the threaded spindle.

- Screw assembly device -T10134- with Allan screws -A- up to the stop onto the crankshaft flange.

- Screw in two M6x35 mm screws -A- by about 3 turns for sealing flange guide into the cylinder block.



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- Move the assembly cup -C- by hand in the -direction of the arrow- until the rotor -B- rests on the crankshaft flange -A-. Subsequently insert the guide bolt with red ball -F- fully into the threaded bore of the crankshaft. If the guide bolt is correctly pushed in, then the handle has a distance of approx. 10 mm from the assembly cup -C-. This gives the rotor its final fitting location.

C - Pressing the rotor onto the crankshaft flange

- Screw in hexagon nut by hand onto the threaded spindle until it rests against the assembly cup.

- Tighten the hexagon nut of the assembly device using a torque wrench with adapter.

Tightening torque: 35 Nm.



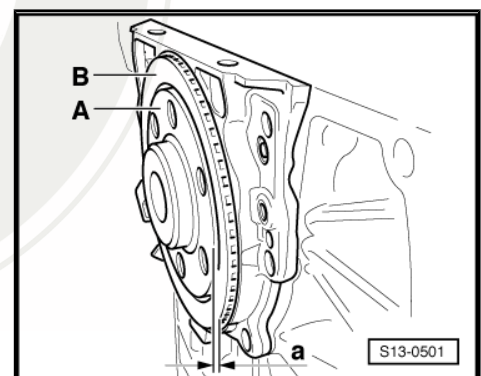
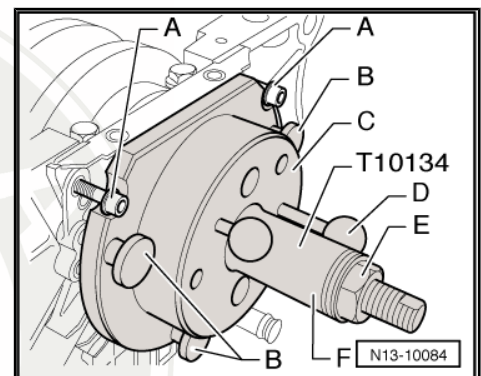
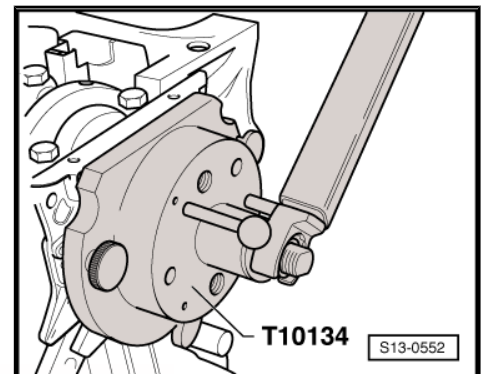
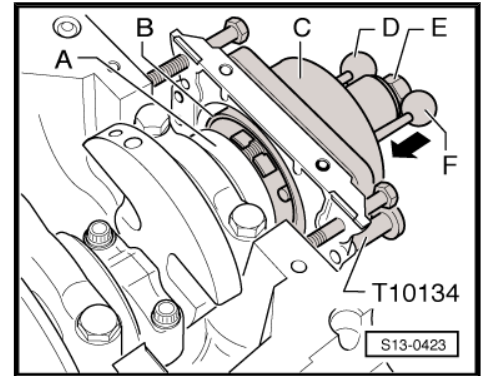
Note

After tightening the nut to 35 mm there must still be a narrow air gap between the cylinder block and the sealing flange.

D - Inspecting the fitting position of the rotor on the crankshaft

- Unscrew hexagon nut -E- up to the end of the threaded spindle.
- Unscrew two M6x35 mm screws -A- from the cylinder block.
- Unscrew three knurled screws -B- from the sealing flange.
- Unscrew two Allan screws and remove assembly device - T10134- .
- Remove sealing lips supporting ring.

The fitting position of the rotor on the crankshaft is accurate if there is a distance -a- = 0.5 mm between the crankshaft flange -A- and the rotor -B-.



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- Position the steel straightedge onto the crankshaft flange.
- Measure the distance between the steel straightedge and the rotor with a feeler gauge.

If the measured distance is below 0.5 mm:

- Press down rotor ➔ [page 48](#) .

If the dimension is correct:

- Tighten the new fixing screws of the sealing alternately cross-wise.

Tightening torque: 10 Nm.

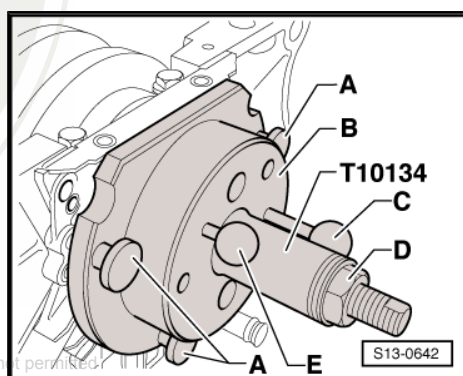
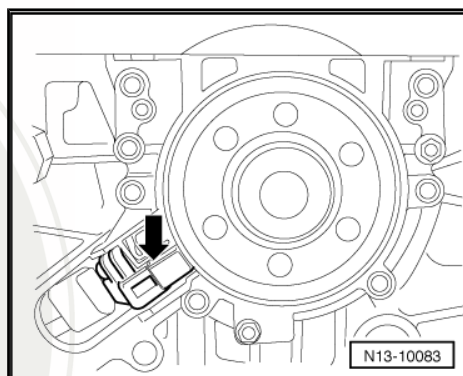
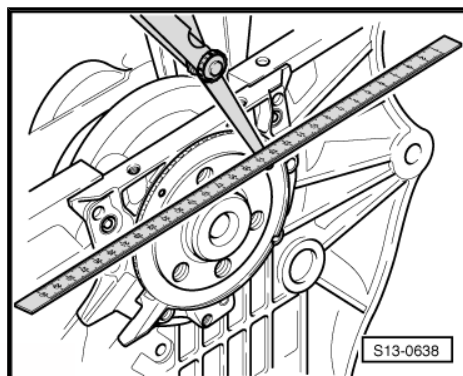
- Install engine speed sender -arrow-.

Tightening torque: 5 Nm.

- Install oil pan ➔ [page 95](#) .
- Fit intermediate plate.
- Install flywheel with new screws.

E - Pressing down the rotor

- Screw assembly device -T10134- with Allan screws up to the stop onto the crankshaft flange.
- Screw in three knurled screws -A- into the flange.
- Subsequently insert the guide bolt with red ball -E- fully into the threaded bore of the crankshaft. If the guide bolt is correctly slipped on, then the handle has a distance of approx. 10 mm from the assembly cup -B-.



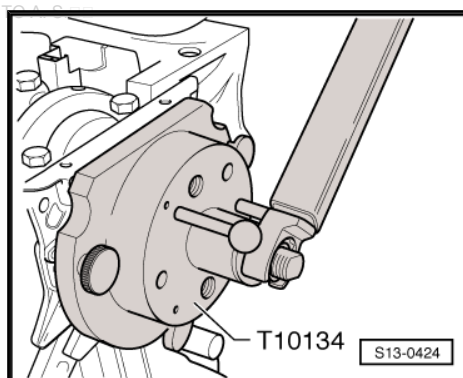
- Tighten the hexagon nut of the assembly device using a torque wrench with adapter.

Tightening torque: 40 Nm.

- Again inspect the fitting position of the rotor on the crankshaft ➔ [page 47](#) .

If the dimension -a- is again too small:

- Tighten the hexagon nut of the assembly device to 45 Nm.
- Again inspect the fitting position of the rotor on the crankshaft ➔ [page 47](#) .



4 Crankshaft

4.1 Summary of components



Note

If considerable quantities of metal swarf or abrasion is found when carrying out engine repairs, this can be subject to damage to the crankshaft and conrod bearings. In order to avoid consequential damage, after the repair perform the following tasks:

- Carefully clean the oil galleries.
- Replace oil spray jets.
- Replace engine oil cooler.
- Replace oil filter.
- ◆ Secure the engine with engine mount -MP 1-202- on the assembly stand -MP 9-101- before performing assembly work.

1 - 50 Nm + torque a further 1/4 turn (90°)

- ☐ replace

2 - Bearing caps

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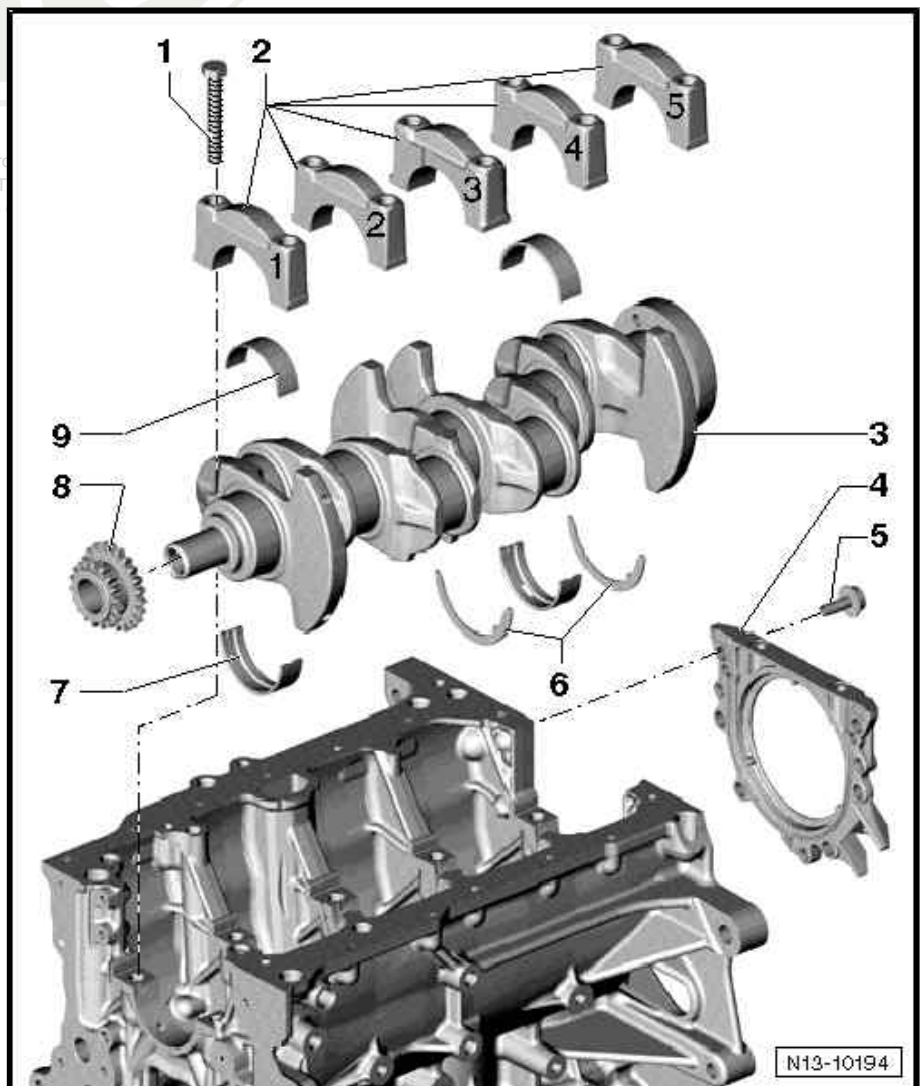
- ☐ do not mix up bearing cap (mark)
- ☐ bearing cap 3 with recesses for thrust washers
- ☐ retaining lugs of the bearing shells of the cylinder block/bearing cap must be on top of one another

3 - Crankshaft

- ☐ Axial play when new: 0.07...0.24 mm
Wear limit: 0.26 mm
- ☐ Crankshaft bearing pins: $\varnothing$ 54.00 mm
- ☐ Conrod bearing: $\varnothing$ 47.80 mm
- ☐ on vehicles with automatic gearbox with needle bearing
- ☐ Pull out the needle bearing of the crankshaft and drive it in [⇒ page 50](#)

4 - Sealing flange -on the gearbox side-

- ☐ Only replace sealing flange complete with gasket ring and rotor
- ☐ replace [⇒ page 43](#)





5 - 10 Nm

- ☐ replace

6 - Thrust washers

- ☐ for bearing cap 3
- ☐ pay attention to locating element

7 - Bearing shell

- ☐ in cylinder block

8 - Sprocket

- ☐ removing and installing ⇒ [page 67](#)
- ☐ for oil pump drive and timing chain
- ☐ Clamping surfaces must be free of oil and grease.

9 - Bearing shell

- ☐ in bearing cap
- ☐ do not mix up used bearing shells (mark)

4.2 Pulling out and driving in the needle bearing of the crankshaft

Special tools and workshop equipment required

- ◆ Interior extractor -Kukko 21/2-
- ◆ Countersupport -Kukko 22/1-
- ◆ Centering mandrel -T 30029-



Note

Only on vehicles fitted with automatic gearbox DSG.

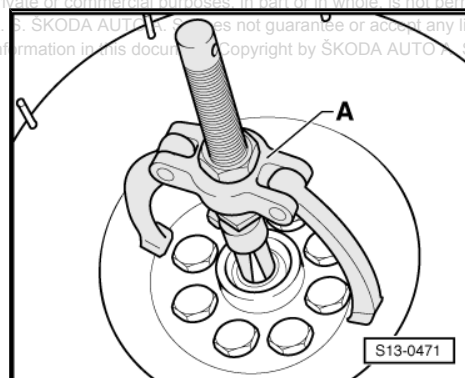
Removing

- Pull out e.g. Kukko 21/2 and Kukko 22/1 with interior extractor with support -A-.

Install

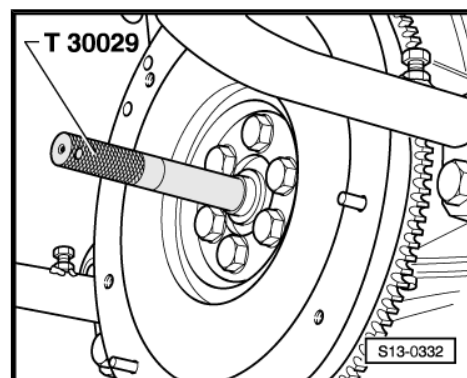
Fitting position of the needle bearing:

- ◆ The marked side of the needle bearing should be visible when in its installed condition.



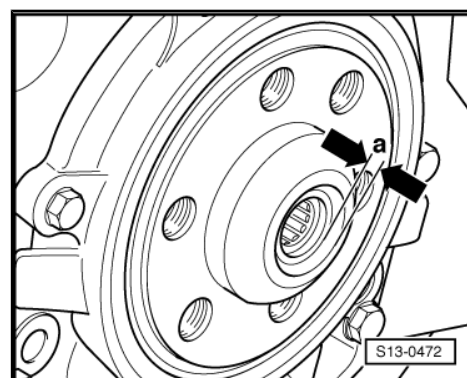


- Drive in using a centering pin -T 30029-



Depth of installation of the needle bearing:

- ◆ Dimension a = 2 mm.



5 Pistons and conrods

5.1 Summary of components



Note

Before assembly oil all bearing and contact surfaces.

1 - Circlip

2 - Piston pin

- ☐ if stiff, heat piston to approx. 60°C
- ☐ use drift -T10046- for removing and installing

3 - Piston

- ☐ check ➔ [page 54](#)
- ☐ mark installation position and matching cylinder
- ☐ arrow on piston crown faces towards the belt pulley side
- ☐ use piston ring tensioning strap for installing
- ☐ Piston Ø: 76.46 mm (nominal dimension)

4 - Compression rings

- ☐ Offset joint 120°
- ☐ use piston ring pliers for removing and installing compression rings
- ☐ Marking "TOP" faces piston crown
- ☐ Inspect gap clearance ➔ [page 53](#)
- ☐ Inspect end clearance ➔ [page 53](#)

5 - Oil scraper rings

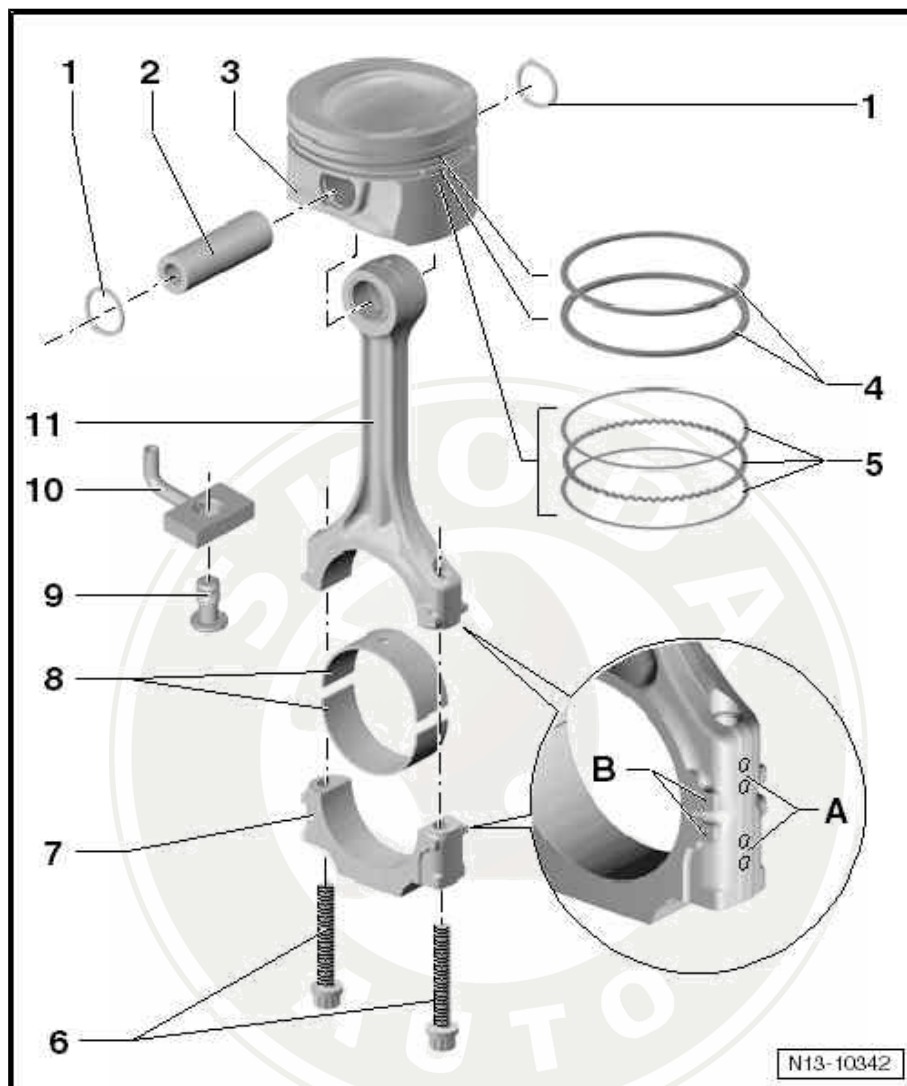
- ☐ carefully remove and install 3-part oil scraper rings by hand
- ☐ Inspect gap clearance ➔ [page 53](#)
- ☐ End clearance cannot be measured

6 - Conrod bolt, 30 Nm + torque a further + 90° (1/4 turn)

- ☐ replace
- ☐ Oil thread and contact surface

7 - Conrod bearing cap

- ☐ As a result of the conrods separated in the cracking process, the cover fits only in one position and only to the relevant conrod.
- ☐ Mark the assignment of the cylinder before removal -A-
- ☐ Fitting position: Marking -B- points to the belt pulley side (mark before removing if marking is missing)



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8 - Bearing shell

- ☐ do not mix up used bearing shells
- ☐ insert bearing shells in the centre

9 - Pressure relief valve, 27 Nm

- ☐ Opening pressure: 0.2 MPa (2.0 bar)

10 - Oil injection nozzle

- ☐ for piston cooling

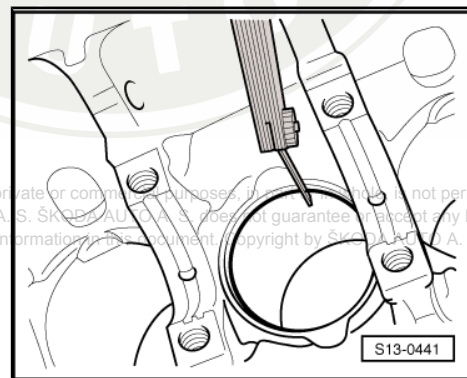
11 - Conrod

- ☐ always replace as a set only
- ☐ mark matching cylinder -A-
- ☐ Fitting position: Marking -B- points to the belt pulley side (mark before removing if marking is missing)
- ☐ located axially by pistons
- ☐ separate new conrod → [page 54](#)

5.2 Inspect piston, piston rings and cylinder bore

Inspecting piston ring gap clearance

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Special tools and workshop equipment required

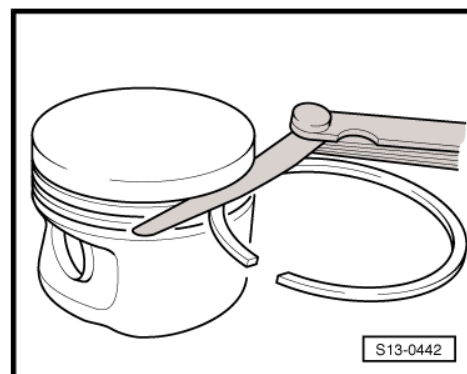
- ◆ Feeler gauge
- Insert ring at right angles from above down into lower cylinder opening, about 15 mm away from edge of cylinder. To insert use piston without rings.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0,20 ...0,40	1,0
2. Compression ring	0,40 ...0,60	1,0
Oil scraper ring	0,20 ...0,8	no wear indication possible

Inspect piston ring end clearance

Special tools and workshop equipment required

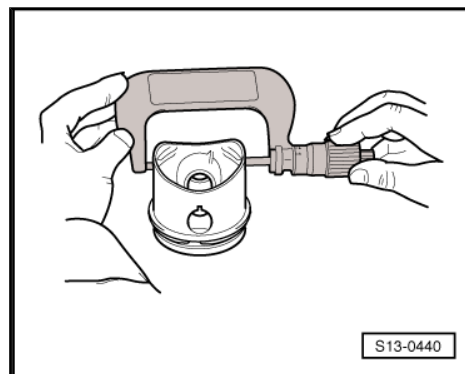
- ◆ Feeler gauge



- Clean ring groove before inspecting.

Piston ring dimensions in mm	New	Wear limit
1. Compression ring	0,04 ... 0,08	0,15
2. Compression ring	0,02 ... 0,06	0,15
Oil scraper ring	cannot be measured	

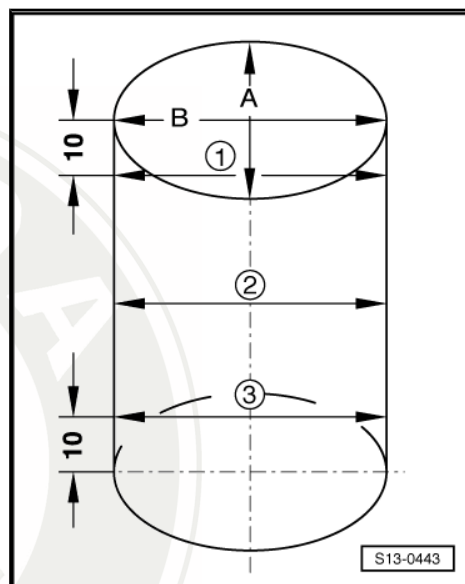
Inspecting pistons



Special tools and workshop equipment required

- ◆ External micrometer 75...100 mm
- Measure about 12 mm from the lower edge and vertically offset to piston pin axis.
- Deviations from specified dimension: max. 0.04 mm

Inspecting cylinder bore



Special tools and workshop equipment required

- ◆ Internal precision measuring instrument 50...100 mm
- Measure at 3 points crosswise in a transverse direction -A- and lengthwise -B-.
- Deviations from specified dimension: max. 0.08 mm



Note

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Do not measure the cylinder bore if the cylinder block is fixed to the assembly stand -MP 1-202- with the engine mount -MP 9-101 -, as this may result in incorrect measurements.

5.3 Separating new conrod

It can happen that on new conrods, the provided separation point is not completely cracked. If the conrod bearing cap cannot be removed by hand, then proceed as follows:

- Mark the assignment of the conrod to the cylinder.

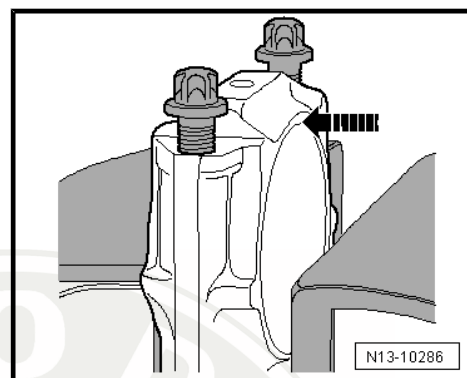
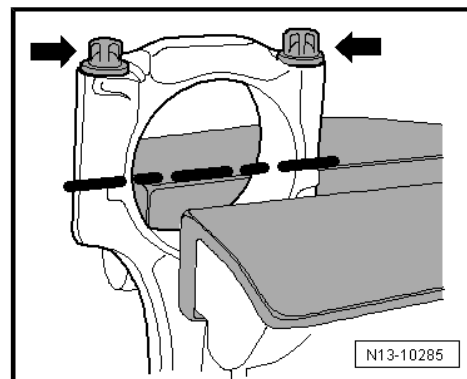


- Slightly clamp the conrod in a vice provided with aluminium protective jaws, as shown in the illustration.



Note

- ◆ *Only tension the conrod slightly in order to avoid damage.*
- ◆ *The conrod is clamped below the broken line.*
- Unscrew both screws -arrows- by approx. 5 turns.
- Carefully knock against the conrod bearing cap with a rubber hammer in -direction of arrow- in order to loosen it.



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15 – Cylinder Head, Valve Gear

1 Cylinder head - part 1

1.1 Summary of components

Testing compression pressure ⇒ [page 83](#) .



Note

- ◆ When installing a replacement cylinder head, all the contact surfaces between the supporting elements, roller rocker arms and the cam tracks must be oiled before installing the camshaft housing.
- ◆ Do not remove the plastic bases supplied as a protection for the open valves until just before fitting on the cylinder head.
- ◆ If the cylinder head is replaced, also the entire coolant must be replaced.
- ◆ Before assembly moisten all bearing and contact surfaces with oil.
- ◆ Removing and installing intake manifold ⇒ [page 174](#) .

1 - 8 Nm

2 - High pressure pump

- ☐ for fuel supply
- ☐ with fuel pressure regulating valve -N276 -
- ☐ removing and installing ⇒ [page 178](#)

3 - Guide

- ☐ Screwed onto camshaft housing to 8 Nm

4 - to air filter

5 - 10 Nm

6 - Hall sender -G40-

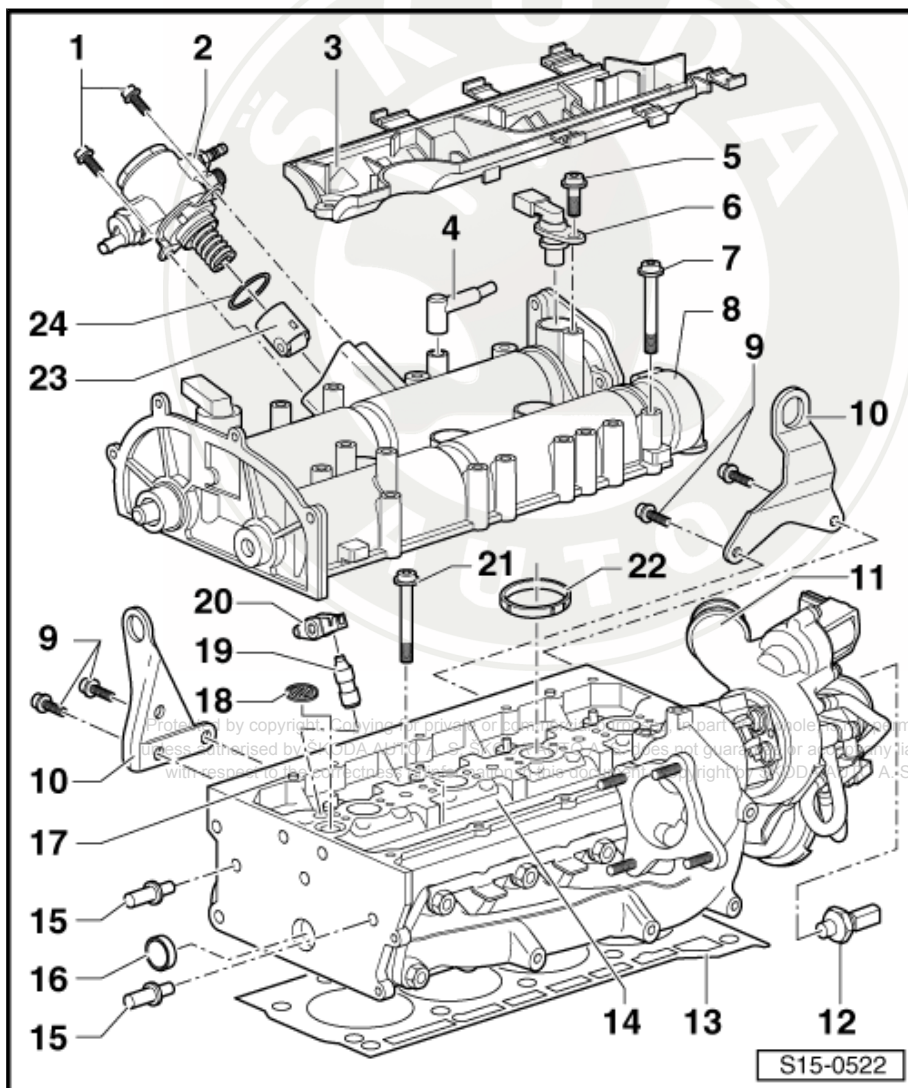
- ☐ with O-ring
- ☐ replace the O-ring if it is damaged

7 - 10 Nm + torque a further 1/4 turn (90°)

- ☐ replace
- ☐ unscrew from the outside to the inside ⇒ [page 75](#)
- ☐ tighten from the inside to the outside ⇒ [page 75](#)

8 - Camshaft housing

- ☐ removing and installing ⇒ [page 75](#)





9 - 20 Nm

10 - Lifting eye

11 - Exhaust gas turbocharger

- ☐ removing and installing ⇒ [page 149](#)

12 - Oil pressure switch -F1- , 25 Nm

- ☐ check ⇒ [page 100](#)
- ☐ Cut open gasket ring if leaking and replace

13 - Cylinder head gasket

- ☐ replace
- ☐ metal gasket
- ☐ after replacing fill entire system with fresh coolant

14 - Cylinder head

- ☐ removing and installing ⇒ [page 80](#)
- ☐ check for distortion ⇒ [page 58](#)
- ☐ Sealing surfaces to the camshaft housing must be free of oil and grease.
- ☐ after replacing fill entire system with fresh coolant

15 - Guide bolt

- ☐ Tightening torque: 20 Nm

16 - Screw cap

- ☐ replace if leaking

Removing:
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- Pierce through the centre using an expanding mandrel and pull out as straight as possible using a suitable tool.

Make sure the sealing surface on the cylinder head is not damaged.

Installing:

- Thoroughly clean the sealing surface in the cylinder head
- Thinly coat the new screw cap sideways all around with sealant -D 154 102 A1- .
- Drive screw cap with drift pin e.g. pressure plate -MP 3-410 (VW 434)- straight into the hole.
- The finishing edge of the screw cap must be approx. 1 mm deep in relation to the end face of the cylinder head.
 - Wipe off any sealant oozing out.

17 - Fit pin

18 - Oil filter

- ☐ inserted into the cylinder head
- ☐ replace

19 - Supporting element

- ☐ do not interchange
- ☐ with hydraulic valve clearance compensation
- ☐ oil contact surfaces

20 - Roller rocker arm

- ☐ inspect roller bearings for smooth operation
- ☐ oil contact surfaces
- ☐ to install clip onto the supporting element with the locking clips



21 - Cylinder head bolt

- ☐ replace
- ☐ observe the mounting instructions and sequence for loosening and tightening ⇒ [page 80](#)

22 - Sealing ring

- ☐ replace
- ☐ 4 pieces
- ☐ inserted into the cylinder head

23 - Roller tappet

- ☐ Lightly moisten the contact surface with engine oil

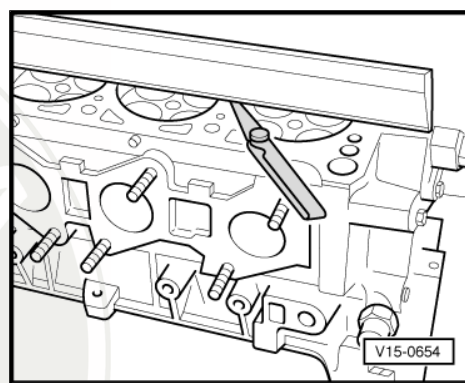
24 - O-ring

- ☐ replace
- ☐ moisten with oil before inserting

Inspecting the cylinder head for distortion

Check with straightedge 500 mm , e. g. -VAS 6075- and feeler gauge.

- Max. permissible distortion: 0.05 mm



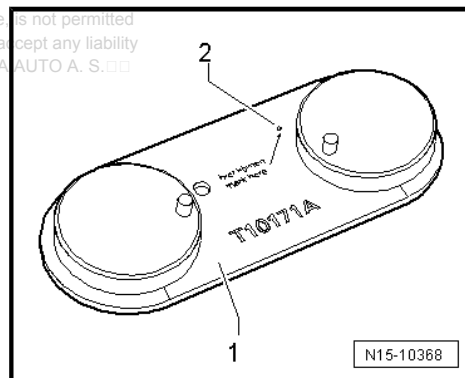
1.2 Change camshaft fixer/locator -T10171- in camshaft fixer/locator -T10171 A-



Note

The fixing points for securing the camshaft fixer/locator have changed. A new special tool with the designation camshaft fixer/locator -T10171 A- is inserted. The previous camshaft fixer/locator -T10171- can furthermore be used if it is machined as described below.

- Lay down the template -1- on the camshaft fixer/locator -T10171- as shown.
- Mark the camshaft fixer/locator -T10171- with a punch mark on the marking -2-.
- Drill through the camshaft fixer/locator -T10171- using a 7 mm drill.
- Trim hole on both sides.
- Additionally mark the tool designation "T10171" with an "A".



1.3 Test timing

Special tools and workshop equipment required

- ◆ Adapter for dial gauge -T10170- or -T10170 A-

◆ Camshaft fixer/locator -T10171 A-

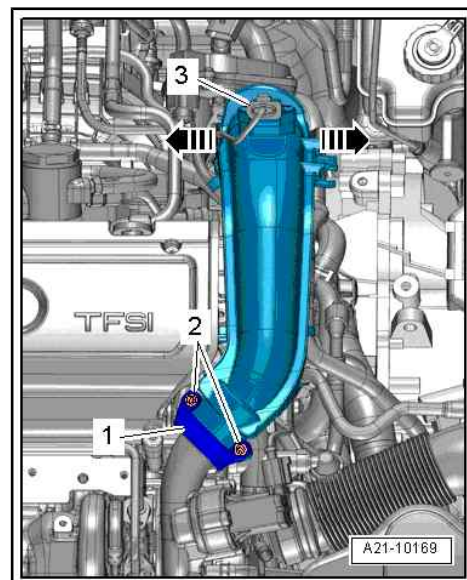
Change camshaft fixer/locator -T10171- in camshaft fixer/locator -T10171 A- ➔ [page 58](#) .

◆ Dial gauge, commercially available

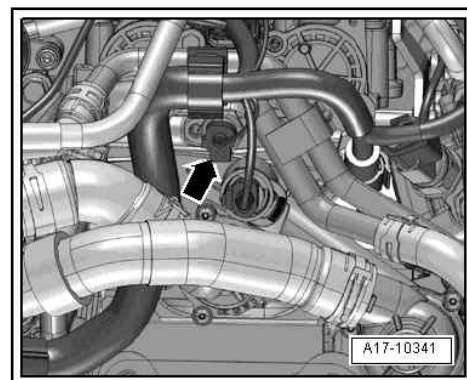
Test sequence

- Remove engine cover ➔ [page 9](#) .
- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.

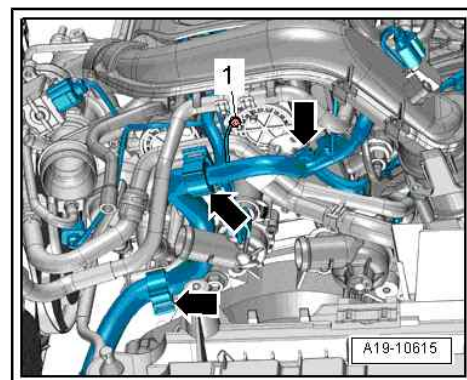
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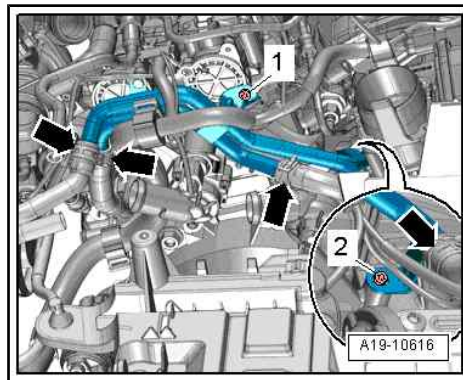
- Disconnect plug -arrow- at oil pressure switch -F1- .



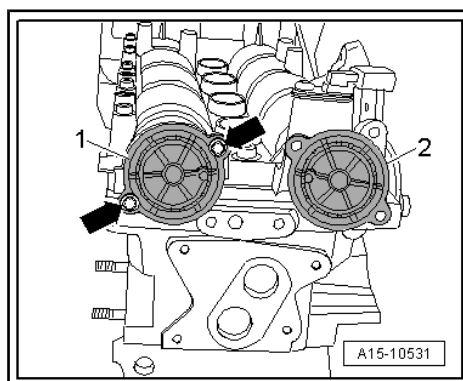
- Release screw -1- for earth lead.



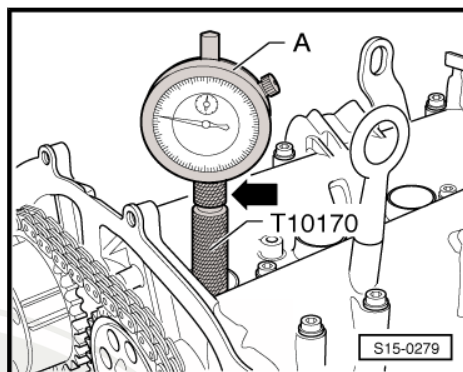
- Release screws -1- and -2- and push the left coolant pipes to the left side.



- Release screws -arrows-, take off cap -1- and -2-.
- Remove ignition coil from cylinder 1 ➔ [page 202](#) and release the spark plug.



- Screw adapter for dial gauge -T10170- up to the stop into the spark plug thread.
- Insert the dial gauge -A- with extension -T10170/1- up to the stop and fix in place using the clamping screw -arrow-.
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1. Note down the position of the small pointer of the dial gauge.

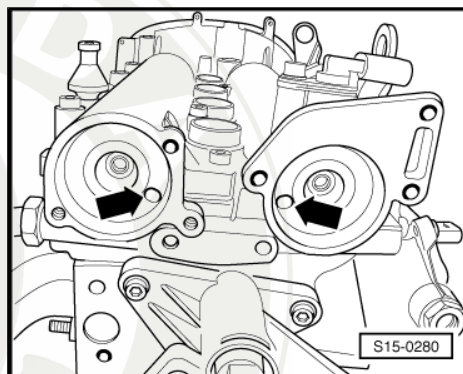


The holes -arrows- in the camshafts must be positioned as shown. If necessary rotate the crankshaft a further revolution (360°).



Note

- ◆ If the crankshaft was turned more than 0.01 mm past the top dead centre, the crankshaft must once again be turned approx 45° in the opposite direction of rotation of the engine. Then position the crankshaft in direction of rotation of engine on top dead centre of cylinder 1.
- ◆ Permissible deviation from TDC of cylinder 1: ± 0.01 mm.



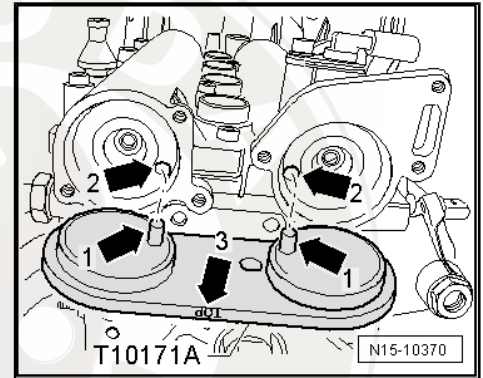
- Insert camshaft fixer/locator -T10171 A- up to the stop into the holes in the camshaft housing.
- The locking bolts -arrows 1- must engage in the holes -arrows 2-. The inscription "TOP" -arrow 3- must be legible from above.

If the camshaft fixer/locator -T10171 A- is not insertable up to the stop in the camshaft openings, the timing is not correct and must be set ➔ [page 61](#) .

The timing is O.K., if the camshaft fixer/locator -T10171 A- can be inserted up to the stop into the camshaft openings.

Further installation occurs in a similar way in reverse order to removal. Pay attention to the following:

- ◆ Replace the gasket rings for the caps of the camshafts and oil before assembly.



1.4 Setting the timing

Special tools and workshop equipment required

- ◆ Adapter for dial gauge -T10170- or -T10170 A-
- ◆ Camshaft fixer/locator -T10171 A-

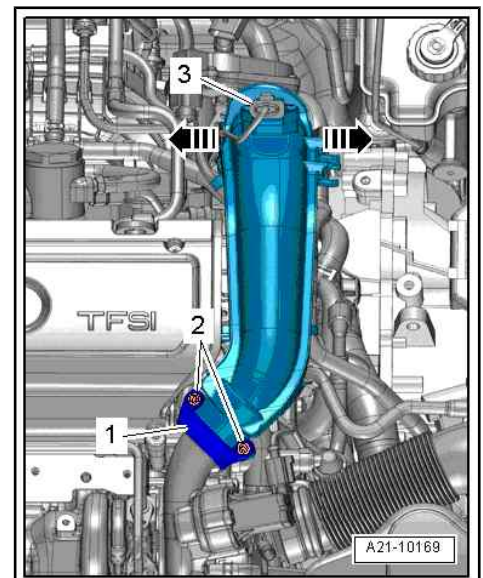
Change camshaft fixer/locator -T10171- in camshaft fixer/locator -T10171 A- ➔ [page 58](#) .

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- ◆ Counterholder -T10172-
- ◆ Locating screw -T10340-
- ◆ Counterholder -T30004 (3415)-
- ◆ Rig pin -T40011-
- ◆ Dial gauge, commercially available

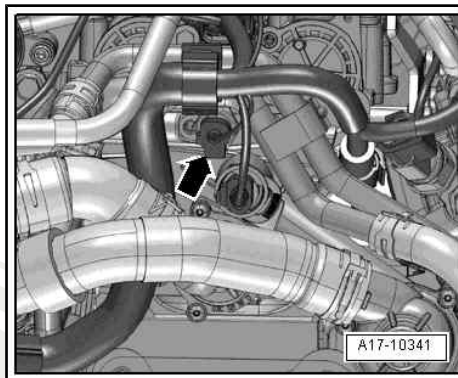
Work procedure

- Remove engine cover ➔ [page 9](#) .
- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.

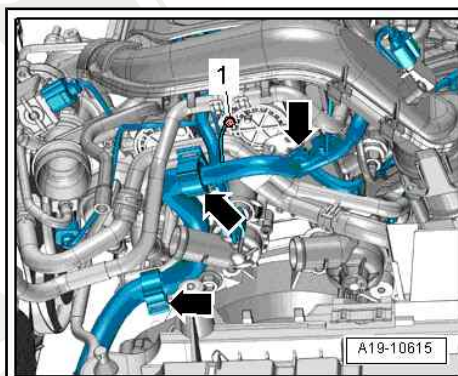




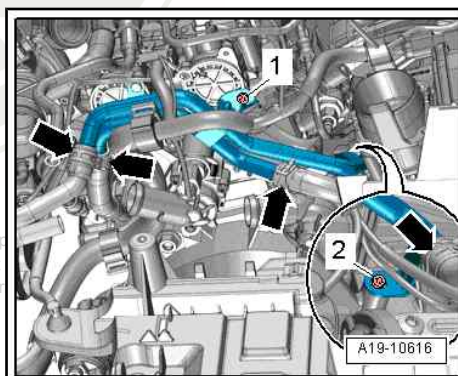
- Disconnect plug -arrow- at oil pressure switch -F1- .



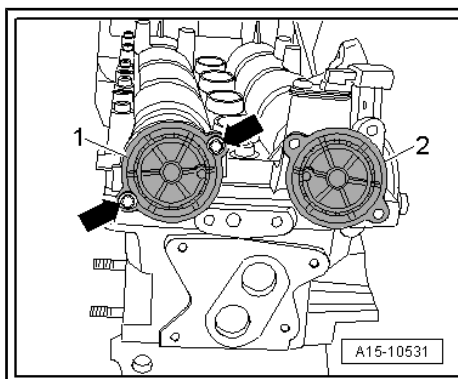
- Release screw -1- for earth lead.



- Release screws -1- and -2- and push the left coolant pipes to the left side.

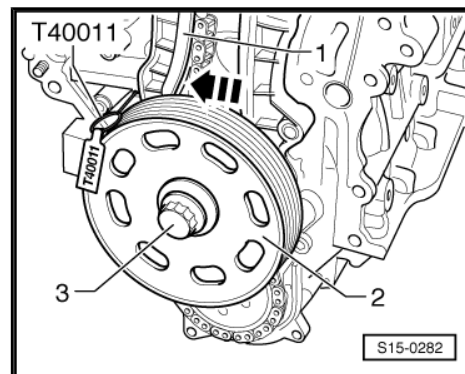


- Release screws -arrows-, take off cap -1- and -2-.
- Remove timing case ➔ [page 32](#) .

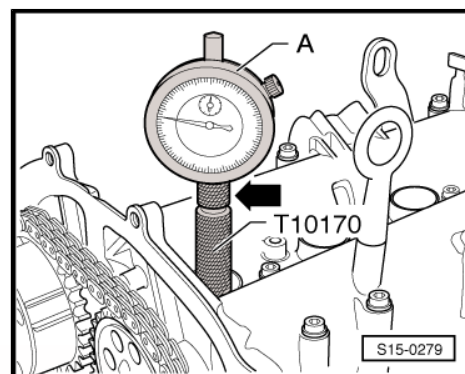


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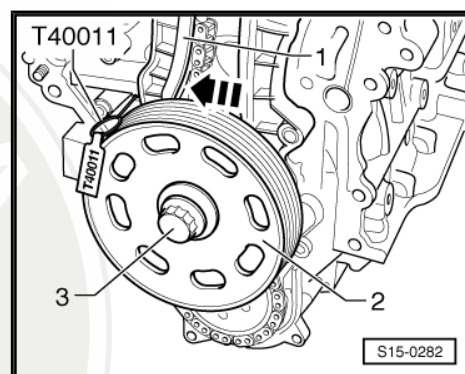
- For turning the crankshaft insert the bushing, the crankshaft belt pulley -2- and the fixing screw -3- and tighten the fixing screw (use counterholder -T30004 -).
- Remove ignition coil from cylinder 1 => [page 202](#) and release the spark plug.



- Screw adapter for dial gauge -T10170 - up to the stop into the spark plug thread.
- Insert the dial gauge -A- with extension -T10170/1- up to the stop and fix in place using the clamping screw -arrow-.
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1. Note down the position of the small pointer of the dial gauge.
- Turn crankshaft 45° in the opposite direction of rotation of the engine.



- Press the tensioning rail -1- in -direction of arrow- and interlock the piston with the rig pin -T40011- .



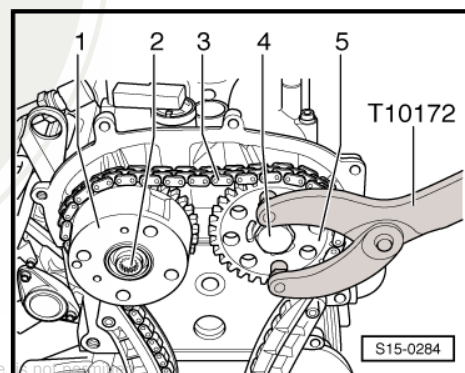
- Mark with a suitable felt-tip pen the direction of rotation of the timing chain -3-.



Note

The fixing screw of the camshaft adjuster -2- has a left-hand thread.

- Release screws -2- and -4- and remove the camshaft adjuster -1- with the timing chain -3-. Use counterholder -T10172- to counterhold.
- Mount again camshaft adjuster -1-.
- Replace screws -2- and -4- and tighten screw -2- to 40 Nm and screw -4- to 50 Nm; to do so use counterholder -T10172- .

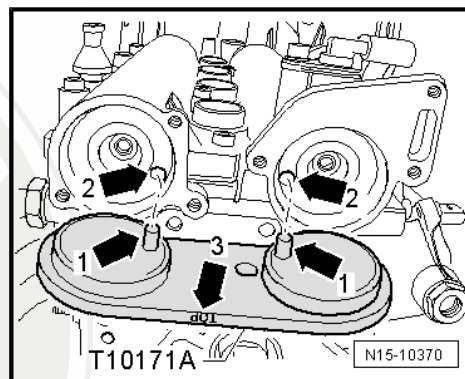


- Turn the inlet and exhaust camshaft until the camshaft fixer/locator -T10171 A- can be inserted up to the stop into the camshaft openings.
- The locking bolts -arrows 1- must engage in the holes -arrows 2-. The inscription "TOP" -arrow 3- must be legible from above.



Note

When turning, the camshafts must not be moved axially.

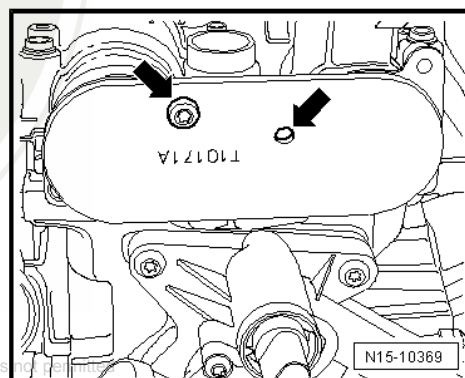


- To secure the camshaft fixer/locator -T10171 A- screw in a M6 screw into the corresponding hole -arrows- by hand; do not tighten.



Note

Pay attention that there are different fixing points for the camshaft fixer/locator -T10171 A-.



- Slacken the screws of the camshaft chain sprockets. Absolutely use counterholder -T10172-.



Caution

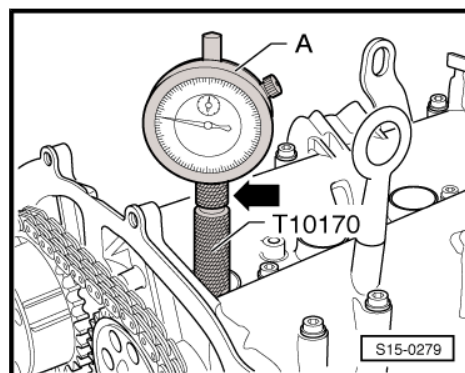
Do not use the camshaft fixer/locator -T10171 A- as a counterholder.

- Removing the camshaft sprocket.
- Place the timing chain onto the camshaft chain sprockets in compliance with the running direction and reinsert the removed chain sprocket.
- Screw in the camshaft screws so far so that the camshaft chain sprockets can still be turned on the camshaft.
- Tighten the timing chain, by pulling out the rig pin -T40011-.
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1.
- Permissible deviation from TDC of cylinder 1: ± 0.01 mm.



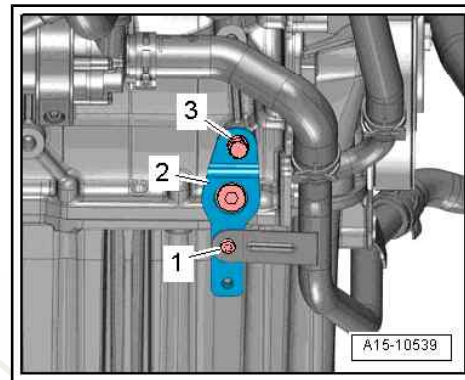
Note

If the crankshaft was turned more than 0.01 mm past the top dead centre, the crankshaft must once again be turned approx 45° in the opposite direction of rotation of the engine. Then position the crankshaft in direction of rotation of engine on top dead centre of cylinder 1.

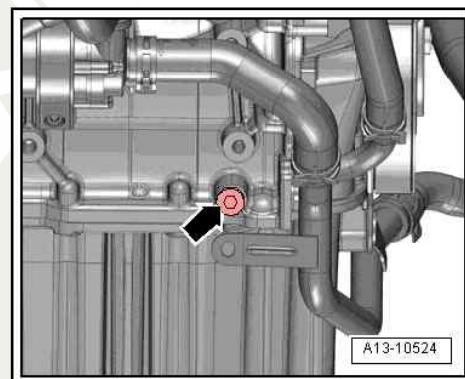




- Unscrew screws -1- (8 Nm) and -3- (40 Nm), remove bracket -2- for right coolant pipe.



- Unscrew screw plug -arrow- for “TDC” bore hole at cylinder block.



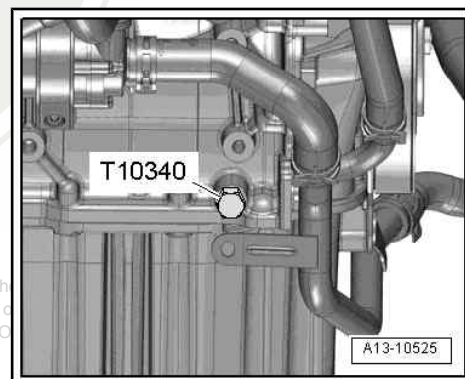
- Turn the fixing screw -T10340- up to the stop in the cylinder block and tighten to 30 Nm.



Note

The crankshaft is only locked in direction of rotation of engine with the fixing screw -T10340-.

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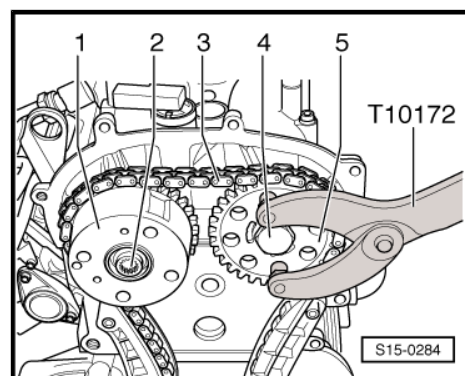
- Hold the camshaft chain sprockets -1- and -5- in this position with the counterholder -T10172- and tighten the screws -2- (left-hand thread) to 40 Nm and -4- to 50 Nm.



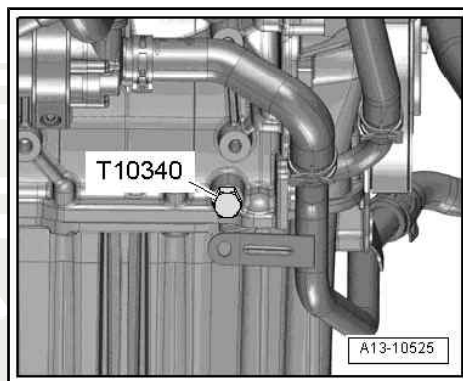
Note

When tightening the camshaft screws, the crankshaft must not turn and the timing chain -3- must remain tightened on both sides.

- Remove the camshaft fixer/locator -T10171 A -.



- Unscrew the fixing screw -T10340- from the cylinder block.
- Turn the crankshaft in direction of rotation of engine by 2 turns on TDC for cylinder 1.
- Permissible deviation from TDC of cylinder 1: ± 0.01 mm.

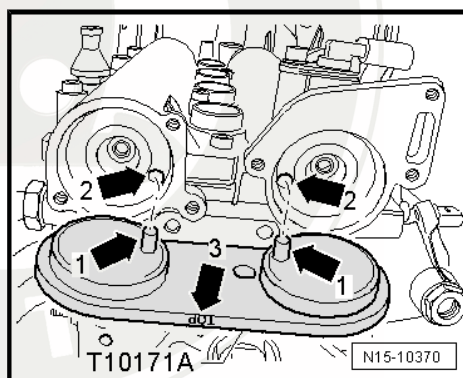


- Insert camshaft fixer/locator -T10171 A- up to the stop into the holes in the camshaft housing.

If the camshaft fixer/locator -T10171 A- is not insertable.

- Repeat setting.

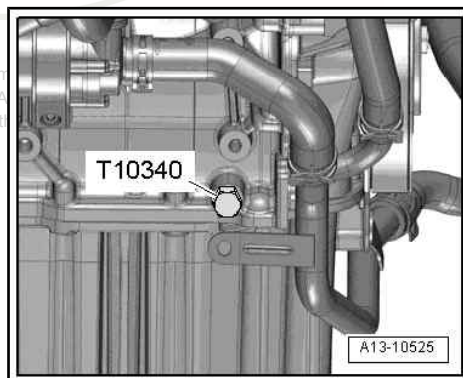
If the camshaft fixer/locator -T10171 A- is insertable.



- Turn the fixing screw -T10340- up to the stop in the cylinder block.

- Tighten fixing screw -T10340- to 30 Nm.

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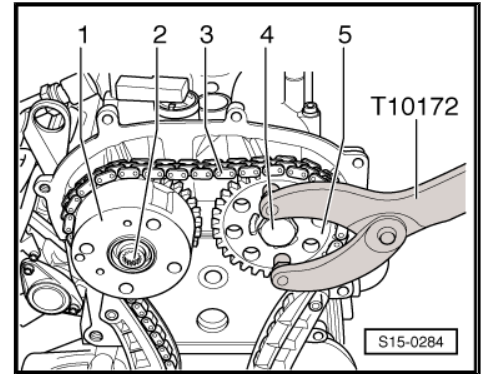


- Remove the camshaft fixer/locator -T10171 A - , hold the camshaft chain sprockets with the counterholder -T10172 - and torque the screws -2- (left-hand thread) and -4- a further 90° (1/4 turn) with a rigid wrench.



Note

- ◆ The fixing screw of the camshaft adjuster -2- has a left-hand thread.
- ◆ The camshaft chain sprockets must not be turned on the camshaft when tightening.



Further installation occurs in a similar way in reverse order to removal. Pay attention to the following:



Note

The locating screw -T10340- remains in the cylinder block until the installation of the crankshaft belt pulley.

- ◆ Install timing case ⇒ [page 32](#) .
- ◆ Install crankshaft belt pulley ⇒ [page 40](#) .
- ◆ Install the V-ribbed belt ⇒ [page 27](#) .
- ◆ Replace the gasket rings for the caps of the camshafts and oil before assembly.

1.5 Removing and installing timing chain and drive chain for oil pump

Special tools and workshop equipment required

- ◆ Counterholder -T30004 (3415)-
- ◆ Extractor -T10094A-
- ◆ Adapter for dial gauge -T10170- or -T10170 A-
- ◆ Camshaft fixer/locator -T10171 A-

Change camshaft fixer/locator -T10171- in camshaft fixer/locator -T10171 A- ⇒ [page 58](#) .

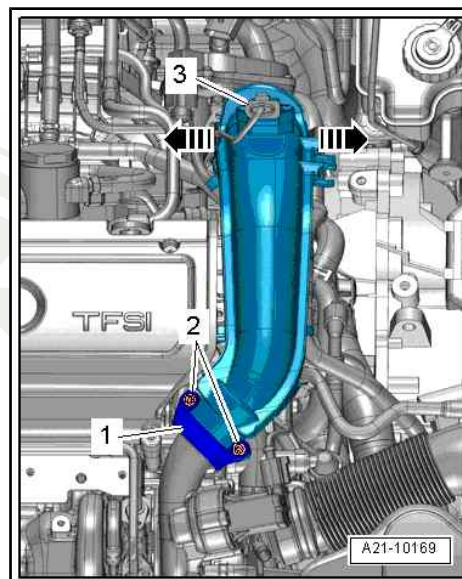
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- ◆ Counterholder -T10172-
- ◆ Rig pin -T40011-
- ◆ Dial gauge , commercially available

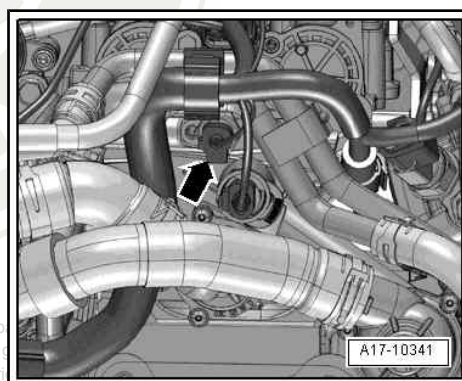
Removing

- Remove engine cover ⇒ [page 9](#) .

- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.

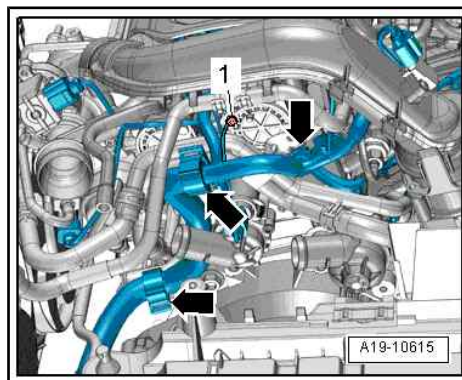


- Disconnect plug -arrow- at oil pressure switch -F1- .

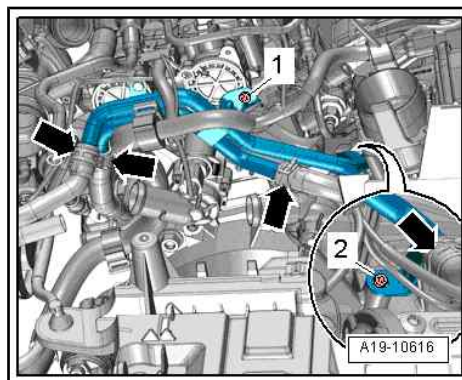


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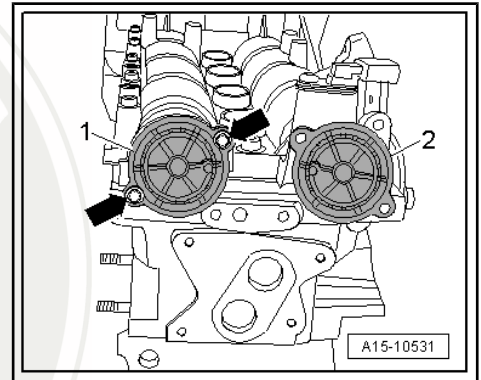
- Release screw -1- for earth lead.



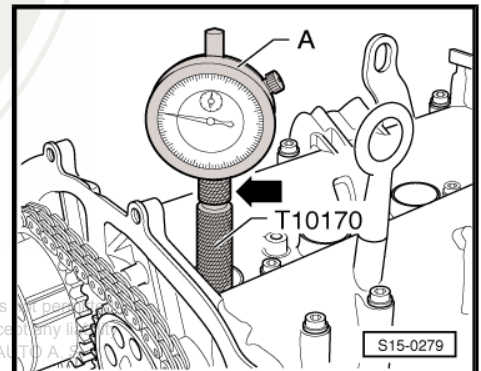
- Release screws -1- and -2- and push the left coolant pipes to the left side.



- Release screws -arrows-, take off cap -1- and -2-.
- Remove ignition coil from cylinder 1 ➔ [page 202](#) and release the spark plug.



- Screw adapter for dial gauge -T10170- up to the stop into the spark plug thread.
- Insert the dial gauge -A- with extension -T10170/1- up to the stop and fix in place using the clamping screw -arrow-.
- Rotate the crankshaft in direction of rotation of engine on TDC for cylinder 1. Note down the position of the small pointer of the dial gauge.

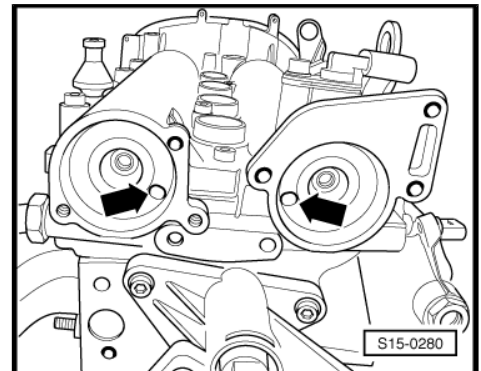


The holes -arrows- in the camshafts must be positioned as shown. If necessary rotate the crankshaft a further revolution (360°).

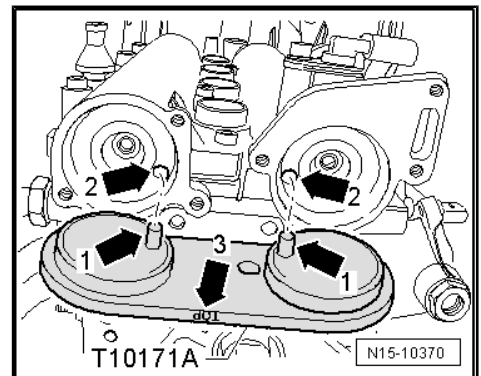


Note

- ◆ *If the crankshaft was turned more than 0.01 mm past the top dead centre, the crankshaft must once again be turned approx 45° in the opposite direction of rotation of the engine. Then position the crankshaft in direction of rotation of engine on top dead centre of cylinder 1.*
- ◆ *Permissible deviation from TDC of cylinder 1: ± 0.01 mm.*



- Insert camshaft fixer/locator -T10171 A- up to the stop into the holes in the camshaft housing.
- The locking bolts -arrows 1- must engage in the holes -arrows 2-. The inscription "TOP" -arrow 3- must be legible from above.





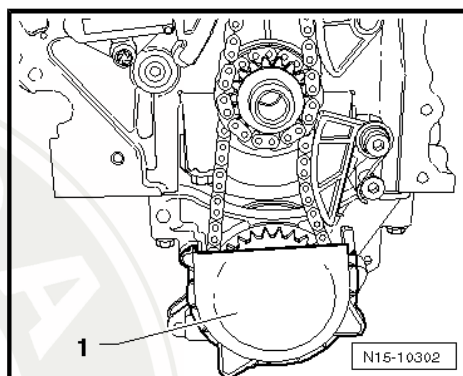
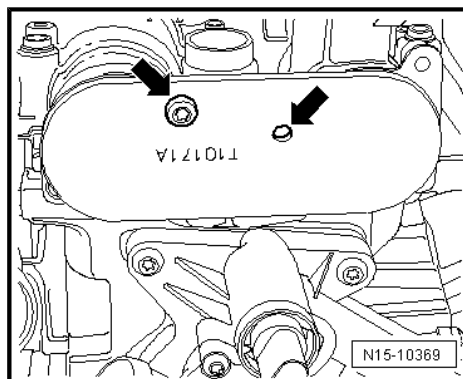
- To secure the camshaft fixer/locator -T10171 A- screw in a M6 screw into the corresponding hole -arrows- by hand; do not tighten.



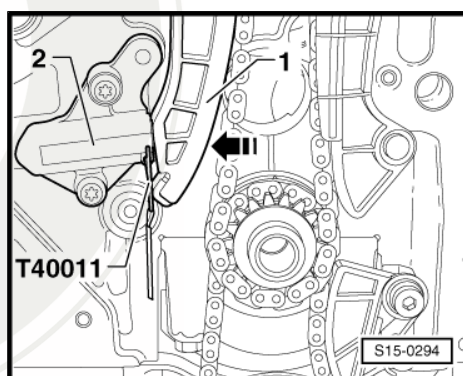
Note

Pay attention that there are different fixing points for the camshaft fixer/locator -T10171 A- .

- Remove timing case ➔ [page 32](#) .
- Pull off cover -1- from chain sprocket of oil pump.



- Press the tensioning rail -1- by hand in -direction of arrow- and interlock the piston of the chain tensioner -2- with the rig pin -T40011- .
- Remove chain tensioner -2-.



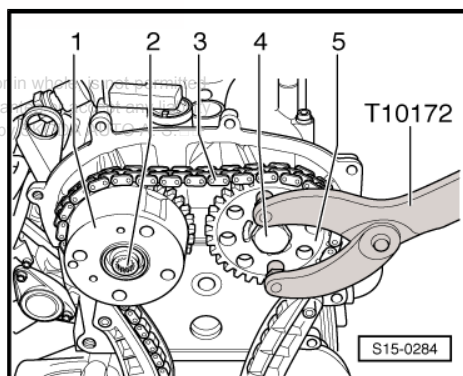
- Mark with a suitable felt-tip pen the direction of rotation of the timing chain -3-.



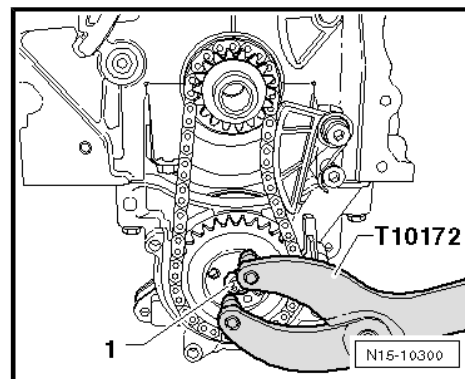
Note

The fixing screw of the camshaft adjuster -2- has a left-hand thread.

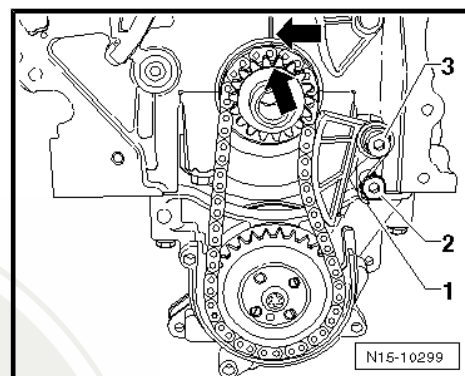
- Release screws -2- and -4- and remove the camshaft adjuster -1- with the timing chain -3-. Use counterholder -T10172- to counterhold.



- Hold the chain sprocket of the oil pump with the counterholder -T10172- and slacken the fixing screw -1-.



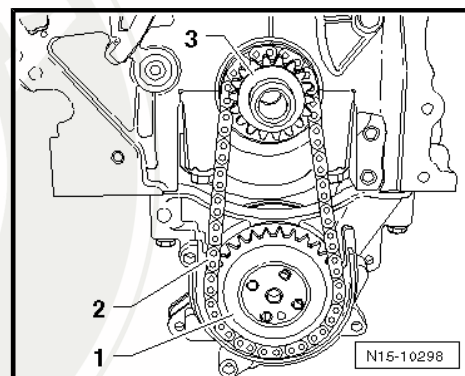
- Lever out tensioning spring -1- at the screw -2- with a screwdriver and remove tensioning spring -1-.
- Unscrew fixing screw -3- and remove the chain tensioner.



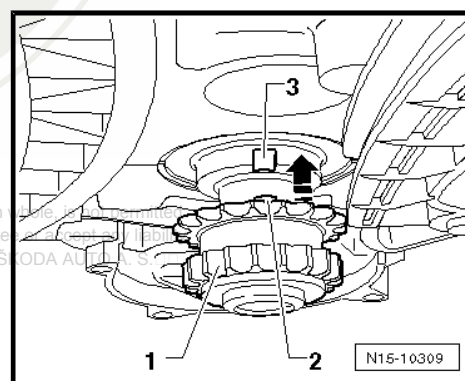
- Mark with a suitable felt-tip pen the direction of rotation of the drive chain for oil pump -2-.
- Release the fixing screw of the chain sprocket -1- and remove the chain sprockets -1- and -3- together with the drive chain of the oil pump -2-.

Install

- The crankshaft must be positioned on top dead centre of cylinder 1.



- Push chain sprocket -1- in -direction of arrow- up to the stop onto the crankshaft journal.

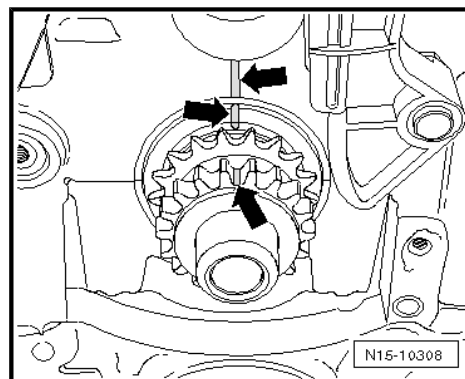


Caution

The integrated peg -2- of the chain sprocket -1- must fit into the slot -3- at the crankshaft stub.

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- Mark the positions of the chain sprocket and the crankshaft to the cylinder block with a felt-tip pen.

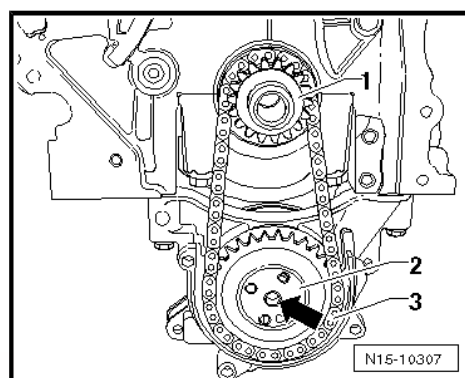


- Fit the drive chain of the oil pump -3- onto the chain sprocket -1-.
- Place the chain sprocket of the oil pump -2- into the drive chain of the oil pump -3- and mount it onto the drive shaft of the oil pump.

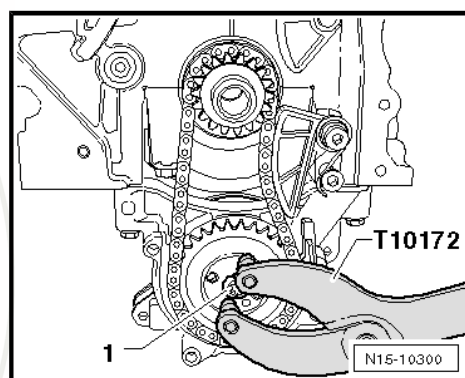


Note

- ♦ *Observe the marking of the running direction on the drive chain for oil pump.*
- ♦ *The drive wheel of the oil pump only adapts to one position on the drive shaft of the oil pump -arrow-.*



- Hold the chain sprocket of the oil pump with the counterholder -T10172-.
- Torque fixing screw -1- to 20 Nm + a further 45° 1/4 turn (90°).

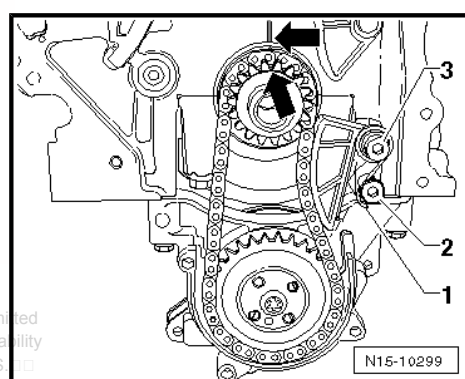


- Position the chain sprocket onto the drive chain of the oil pump and tighten the fixing screw -3- to 15 Nm.
- Lever the tensioning spring -1- onto the screw -2- with a screw-driver.



Note

- ♦ *Observe markings -arrows-.*
 - ♦ *The crankshaft should not turn.*
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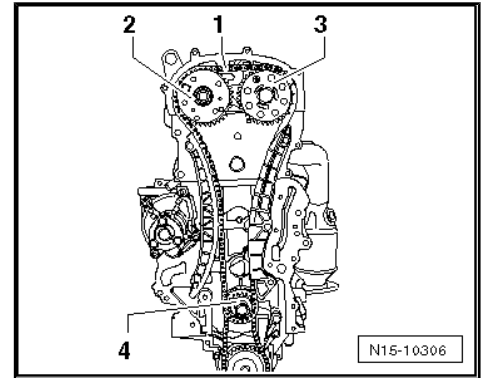




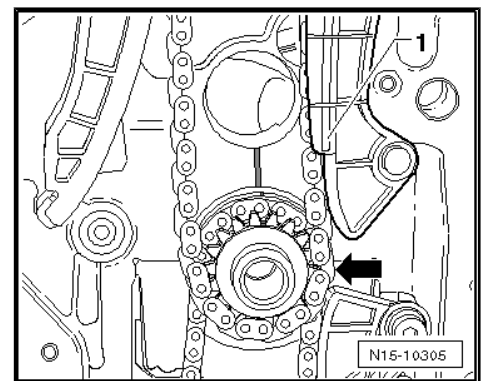
- Screw on the chain sprocket -3- by hand with a new fixing screw.
- Place the timing chain -1- onto the chain sprocket crankshaft -4-, the chain sprocket outlet camshaft -3- and screw on the camshaft adjuster -2- by hand with a new fixing screw.

i Note

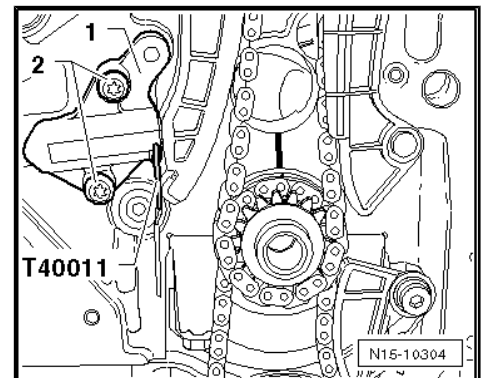
- ◆ *Observe the marking of the running direction on the timing chain -1-.*
- ◆ *Observe that the guide sleeve is installed between the inlet camshaft and camshaft adjuster.*
- ◆ *The fixing screw of the camshaft adjuster -2- has a left-hand thread.*



The timing chain must rest on the sliding rail -1- and on the chain sprocket crankshaft -arrow-.



- Install the chain tensioner -1- and tighten the fixing screws -2- to 9 Nm.
- Tighten the timing chain, by pulling out the rig pin -T40011- from the chain tensioner.
- Check markings on the chain sprocket crankshaft and on the cylinder block; they must be positioned opposite to each other.

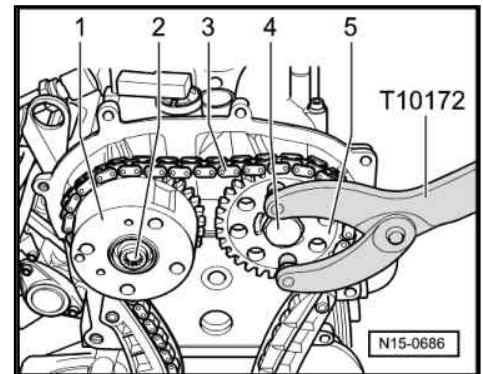


- Tighten the fixing screw -2- to 40 Nm and the screw -4- to 50° Nm (use counterholder -T10172-).

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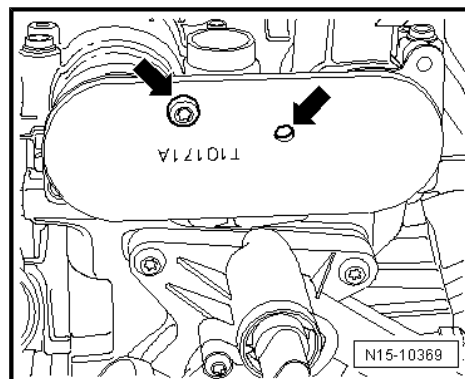
i Note

- ◆ *First the fixing screws -2- and -4- are tightened to the torquing angle (90°), after which the timing is checked.*
- ◆ *The fixing screw of the camshaft adjuster -2- has a left-hand thread.*



- Screw out screw -arrows- and remove the camshaft fixer/locator -T10171 A- from camshaft housing.
- Test timing ⇒ [page 58](#) .

If timing is o.k.:

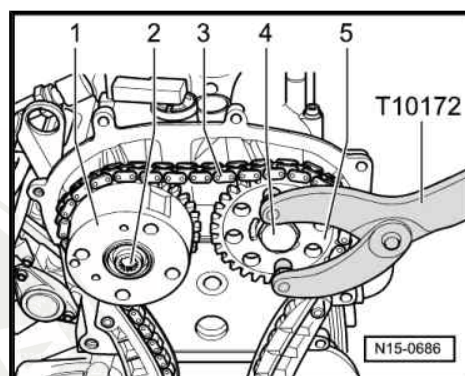


- Hold the camshaft chain sprockets with the counterholder -T10172- and torque the screws -2- (left-hand thread) and -4- a further $\frac{1}{4}$ turn (90°) with a rigid wrench.



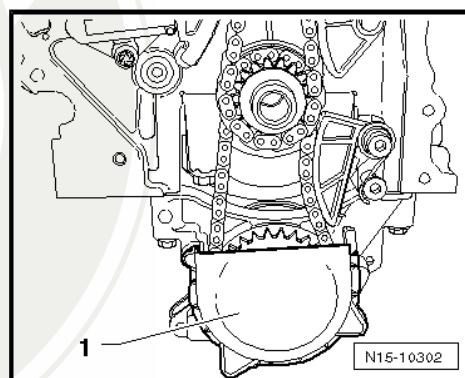
Note

- ♦ The fixing screw of the camshaft adjuster -2- has a left-hand thread.
- ♦ The camshaft chain sprockets must not be turned on the camshaft when tightening.



- Install cover of oil pump gear -1-.
- Install timing case ⇒ [page 32](#) .
- Install crankshaft belt pulley ⇒ [page 40](#) .
- Install the V-ribbed belt ⇒ [page 27](#) .
- Replace the gasket rings for the caps of the camshafts and oil before assembly.

Further installation occurs in a similar way in reverse order to removal.



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2 Cylinder head - part 2

2.1 Removing and installing camshaft housing

Special tools and workshop equipment required

- ◆ Camshaft fixer/locator -T10171 A-
- ◆ Two stud bolts (M6x80)
- ◆ Sealant -D 188 003 A1-
- ◆ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-

2.1.1 Removing



Note

- ◆ *On this engine the camshafts are located in the camshaft housing. Before removing the camshaft housing, the timing case must be removed ⇒ [page 32](#) .*
- ◆ *Do not rework the sealing surface of the camshaft housing.*

Observe safety measures ⇒ [page 3](#) .

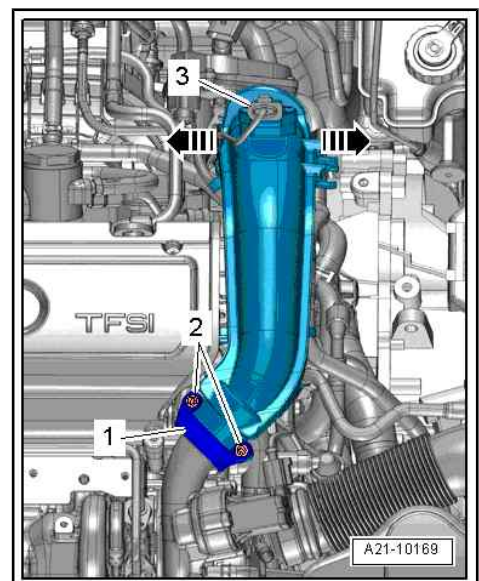
Observe rules for cleanliness ⇒ [page 5](#) .



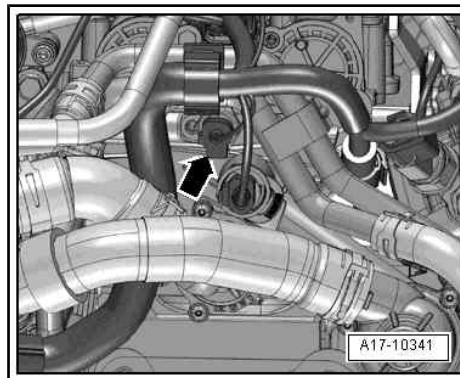
WARNING

***Release pressure in the high pressure area of the fuel system
⇒ [page 4](#) .***

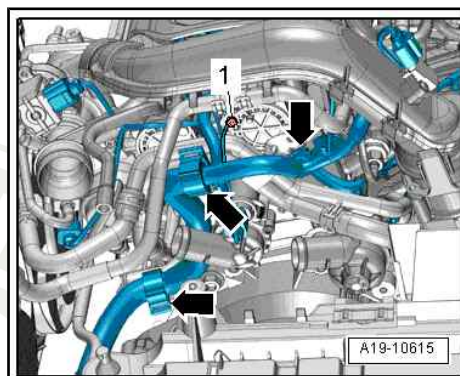
- Remove engine cover ⇒ [page 9](#) .
- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.



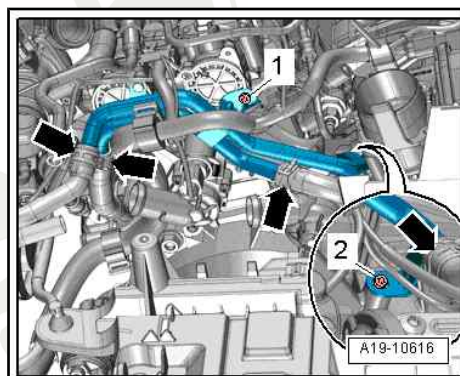
- Disconnect plug -arrow- at oil pressure switch -F1- .



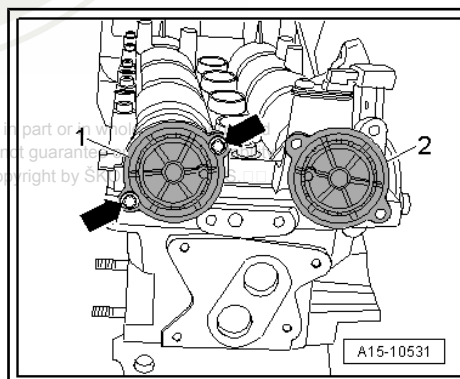
- Release screw -1- for earth lead.



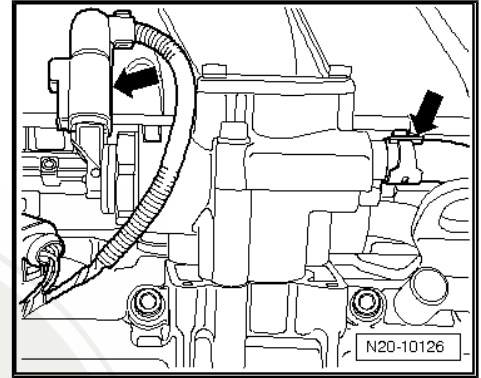
- Release screws -1- and -2- and push the left coolant pipes to the left side.



- Release screws -arrows-, take off cap -1- and -2-.
- Remove exhaust turbocharger ➔ [page 149](#) .
- Remove timing case ➔ [page 32](#) .
- Rotate the crankshaft on TDC for cylinder 1, then turn back the crankshaft approx. 45° in the opposite direction of rotation of the engine and remove the camshaft chain sprockets with the timing chain ➔ [page 61](#) .
- Disconnect the plug from the high pressure pump.
- Removing ignition coils ➔ [page 202](#) .
- Remove cable guide with wiring loom from camshaft housing.



- Remove the fuel feed line -right arrow- from the high pressure pump.



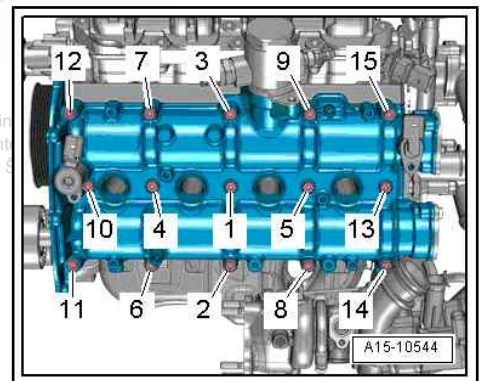
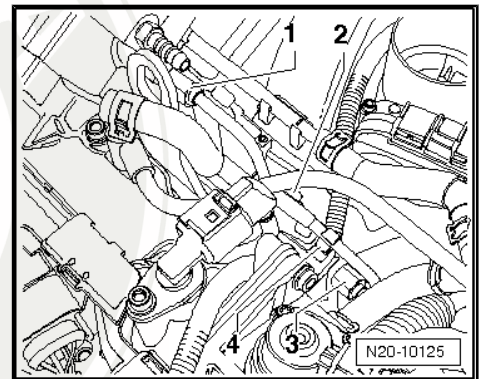
- Disconnect the wiring -2- and remove the clip -4- from the high pressure line.



Note

Hold the screwed connections at the high pressure pump and at the bottom part of intake manifold/fuel distributor when unscrewing the union nuts with a wrench.

- Slacken the union nuts -3- and -1- at the high pressure line.
- Disconnect the plug from the Hall sender - G40- .
- Pull out oil dipstick.
- Unscrew left lifting eye.
- Release screws for camshaft housing in the sequence -15 ... 1-.
- Carefully remove the camshaft housing.



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2.1.2 Install



Caution

Before installing the camshaft housing, screw in the stud bolts (M 6 x 80) at the cylinder head.

The stud bolts guide the camshaft housing and prevent the roller rocker arms sliding off from the supporting elements.

Precondition

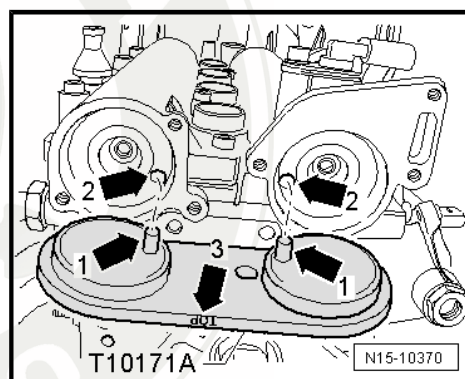
- The pistons must not be positioned at top dead centre.



WARNING

Use protective gloves and protective goggles when working with sealant and grease remover!

- Remove residual sealant on the cylinder head and on the camshaft housing using a chemical sealant remover.
- Degrease the sealing surfaces. They must be free of oil and grease.
- Ensure that no dirt and sealant residues get into the cylinder head.
- Turn the inlet and exhaust camshaft until the camshaft fixer/locator -T10171 A- can be inserted up to the stop into the camshaft openings.



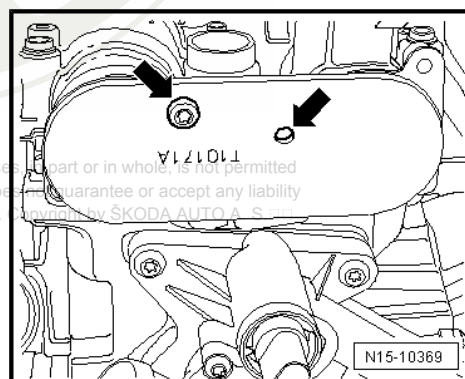
- To secure the camshaft fixer/locator -T10171 A- screw in a M6 screw into the corresponding hole -arrows- by hand; do not tighten.



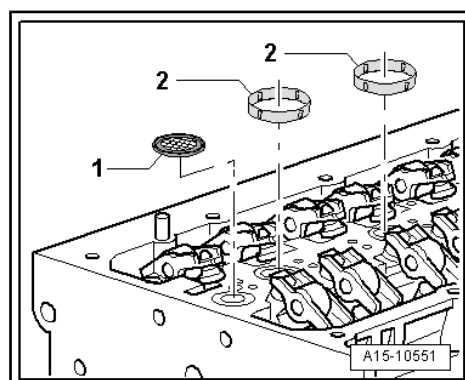
Note

Pay attention that there are different fixing points for the camshaft fixer/locator -T10171 A-.

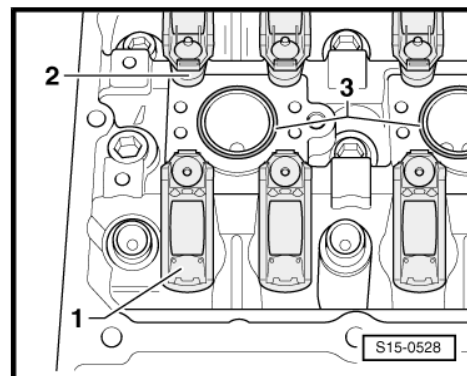
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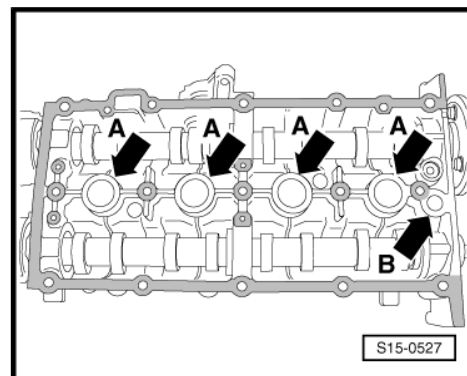
- Replace oil strainer -1- and insert in the cylinder head.
- Insert 4 new gasket rings -2- into the grooves of the cylinder head.



- Ensure that all the roller arms are correctly positioned on the valve stem ends -1- and are clipped in place on the relevant hydraulic supporting elements -2-.



- Apply a thin coating of sealant uniformly on the clean sealing surface of the camshaft housing (see grid surfaces in the illustration).
- Do not apply sealant in the area of the -arrows A-. Here the cylinder head is sealed with the inserted gasket rings.



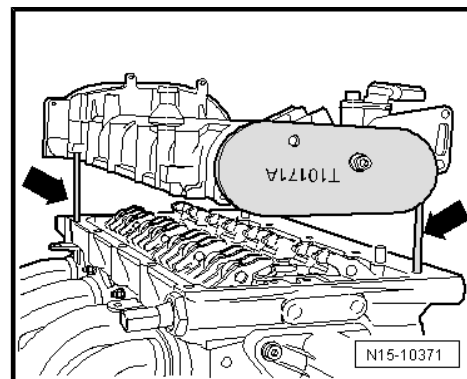
Note

- ◆ No sealant must be applied in the area -arrow B-. Here the oil strainer seals.
- ◆ The sealant must not be applied too thickly, as otherwise excess sealant may penetrate into the oil bores and possibly cause engine damage.
- Screw in two stud bolts (M6x80) into the cylinder head before fitting on the camshaft housing.
- Carefully place the camshaft housing vertically from above onto the pin screws -arrows- and dowel pins of the cylinder head.



Note

Make sure that no residues of oil drop down onto the sealing flange and the camshaft housing does not tilt.





- Tighten the new screws for the camshaft housing in 2 stages in the indicated tightening sequence -1...15- as follows:

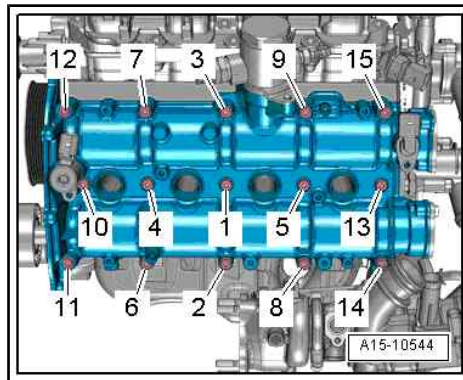
1. Tighten to 10 Nm with the torque wrench.
2. Using a rigid wrench torque a further 90° (1/4 turn).

Make sure that the camshaft housing does not tilt.



Note

After installing the camshaft housing, allow the sealant to dry for about 30 minutes.



- Setting the timing ➔ [page 61](#) .

Further installation occurs in a similar way in reverse order to removal. Pay attention to the following:

- ♦ Install timing case ➔ [page 32](#) .
- ♦ Install exhaust turbocharger ➔ [page 149](#) .
- ♦ Install crankshaft belt pulley ➔ [page 40](#) .
- ♦ Connect fuel lines ➔ [page 178](#) .

2.2 Removing and installing cylinder head

Special tools and workshop equipment required

- ♦ Supporting device -T30099-
- ♦ Base -T30099/1-
- ♦ Support -T10358-
- ♦ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.

Removing

Observe safety measures ➔ [page 3](#) .

Observe rules for cleanliness ➔ [page 5](#) .



WARNING

Release pressure in the high pressure area of the fuel system
➔ [page 4](#) .

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- Drain the coolant from the engine cooling system and the charge air cooling system ➔ [page 103](#) .

Remove the following components:

- ♦ Coolant regulator housing from cylinder head
- ♦ Intake manifold ➔ [page 174](#)
- ♦ Exhaust gas turbocharger ➔ [page 149](#)
- Fit supporting device -T30099- .



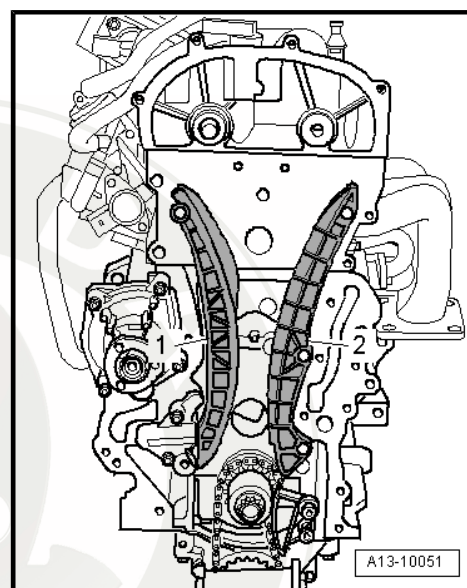
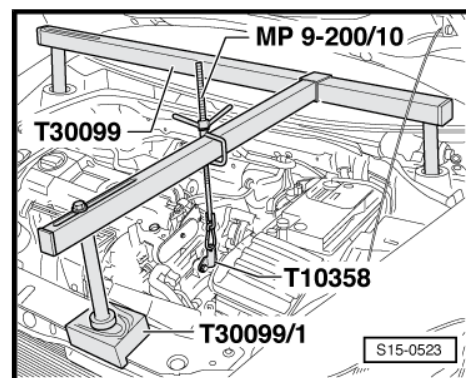
- Unscrew the fixing screw for the gearbox and screw down the bracket -T10358 - as shown.
- Support the engine via the spindle in its installed position and slightly pre-tension.



Note

The timing case is removed with the existing engine mount and the bracket -T10358- .

- Remove timing case ⇒ [page 32](#) .
- Remove the timing chain from the camshaft chain sprockets ⇒ [page 67](#) .
- Remove the tensioning rail -1- and the sliding rail -2- from the bearing bolts.
- Removing the camshaft housing ⇒ [page 75](#) .
- Remove the roller rocker arm together with the supporting elements and lay aside on a clean surface.
- Ensure that the roller rocker arms and the supporting elements are not mixed up.



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- Release the cylinder head bolts in the specified sequence and remove.
- Carefully remove the cylinder head.

Install

Precondition

- The pistons must not be positioned at top dead centre.



Note

- ◆ *Remove the new cylinder head gasket from its wrapping immediately before fitting.*
- ◆ *Treat the new seal with the utmost care. Any damage will result in leaks.*
- ◆ *There must be no oil or coolant in the blind holes of the cylinder head bolts in the cylinder block.*
- Stuff clean cloth into the cylinders to avoid any dirt getting in between cylinder wall and piston.



WARNING

Wear protective gloves when working with sealant and grease remover!

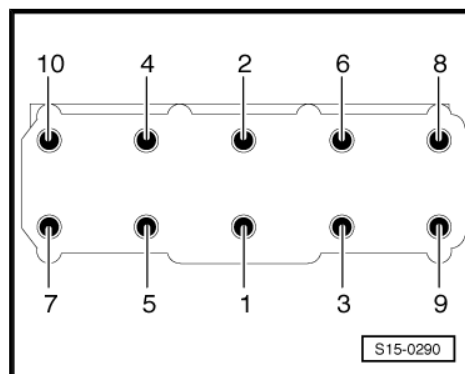
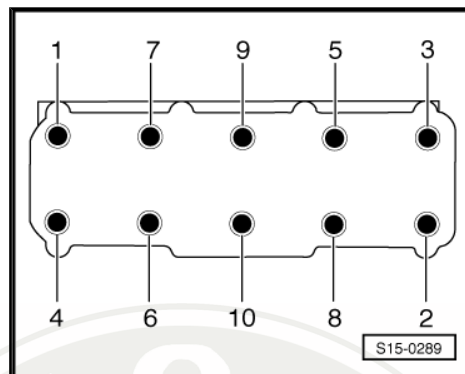
- Make sure that when cleaning the cylinder head and cylinder block no foreign bodies can get into the cylinder or into the oil and coolant galleries.
- Carefully remove residual sealant from the cylinder head and cylinder block with chemical sealant remover.
- Position piston of cylinder 1 to top dead centre and slightly turn the crankshaft anticlockwise again.
- Position the new cylinder heads. Text (part number) must be visible.
- Insert the cylinder head. Pay attention to the dowel pins in the cylinder block.
- Insert new cylinder head bolts and tighten by hand.

- Tighten cylinder head bolts in the tightening order shown as follows:

- ◆ Tighten all screws to 30 Nm.
- ◆ Then, torque all bolts further to 90° (1/4 turn) with a rigid wrench.
- ◆ Finally, once again turn all bolts through a further 90° (1/4 turn).
- Insert the supporting elements in the cylinder head and position the relevant roller rocker arm on the valve stem ends or supporting elements.
- Installing camshaft housing ➔ [page 75](#) .

Further installation occurs in a similar way in reverse order to removal.

- Top up and bleed cooling system ➔ [page 103](#) .





2.3 Testing the compression

Special tools and workshop equipment required

- ◆ Compression tester , e.g. -V.A.G 1763-

Test condition

- Engine oil temperature at least 30°C

Work procedure

- Open lid of fuse carrier in the engine compartment and unplug the fuse for Motronic current supply relay -J271- ⇒ Current flow diagrams and Fitting locations.
- Remove the ignition coils ⇒ [page 202](#) and release the spark plugs.



Note

Removing fuse interrupts the voltage supply of the injection valves and ignition coils.

- Check compression pressure using the compression tester.



Note

Use of tester ⇒ Operating Instructions .

- Operate starter until the tester no longer indicates a pressure rise.

Compression readings

New engine	Wear limit	Difference between cylinders
1... 1.5 MPa (10...15 bar)	0,7 MPa (7 bar)	0.3 MPa (3 bar)

If the specified values are not reached, test the combustion chamber for tightness ⇒ [page 83](#) .

The further assembly is carried out in reverse order to disassembly. Pay attention to the following:

- Install ignition coils ⇒ [page 201](#) .
- Delete the contents of the fault memory for the engine control unit at the end of the work as error messages were stored due to release of the plug ⇒ Vehicle diagnosis, testing and information system VAS 5051.

2.4 Testinf the combustion chamber for tightness

Special tools and workshop equipment required

- ◆ Pressure hose -MP1-210 (VW 653/3)- (replace gasket ring with a spark plug gasket ring)
- ◆ Spark plug wrench

Test sequence

- Unscrew the spark plugs.
- Position piston of the relevant cylinder to dead centre.



- Screw the pressure hose into the spark plug thread.
- Connect pressure hose to compressed air.
- With the assistance of a second mechanic, lock the screw at the crankshaft on TDC position in order to avoid the displacement of the piston after pressure build-up.
- Build up a pressure of approx. 0.3 MPa (3 bar) in the combustion chamber.
- Determine how the pressure escapes:
 - 1 - Via the inlet valve(s) - the pressure enters the throttle valve.
 - 2 - Via the outlet valve(s) - the pressure enters the exhaust system.
 - 3 - Via the piston rings - the pressure enters the cylinder block.



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3 Valve gear

3.1 Valve gear - Summary of components

1 - 40 Nm + torque a further $\frac{1}{4}$ turn (90°)

- ☐ Left-hand thread
- ☐ replace

2 - Camshaft adjuster

- ☐ must not be disassembled
- ☐ removing and installing
⇒ [page 61](#)

3 - Camshaft sprocket

- ☐ take note of the position when installing the timing chain

4 - O-ring

- ☐ replace if damaged
- ☐ before fitting moisten lightly with engine oil

5 - Camshaft adjustment valve 1 -N205 -

- ☐ check ⇒ Vehicle diagnosis, testing and information system VAS 5051

6 - 10 Nm

7 - 10 Nm + torque a further $\frac{1}{4}$ turn (90°)

- ☐ replace
- ☐ tighten from inside to outside

8 - Camshaft housing

- ☐ removing and installing
⇒ [page 75](#)

9 - 10 Nm

10 - Screw cap

- ☐ for inlet camshaft
- ☐ for exhaust camshaft

11 - Roller rocker arm

- ☐ inspect roller bearings
- ☐ oil contact surfaces
- ☐ to install clip onto the supporting element with the locking clips

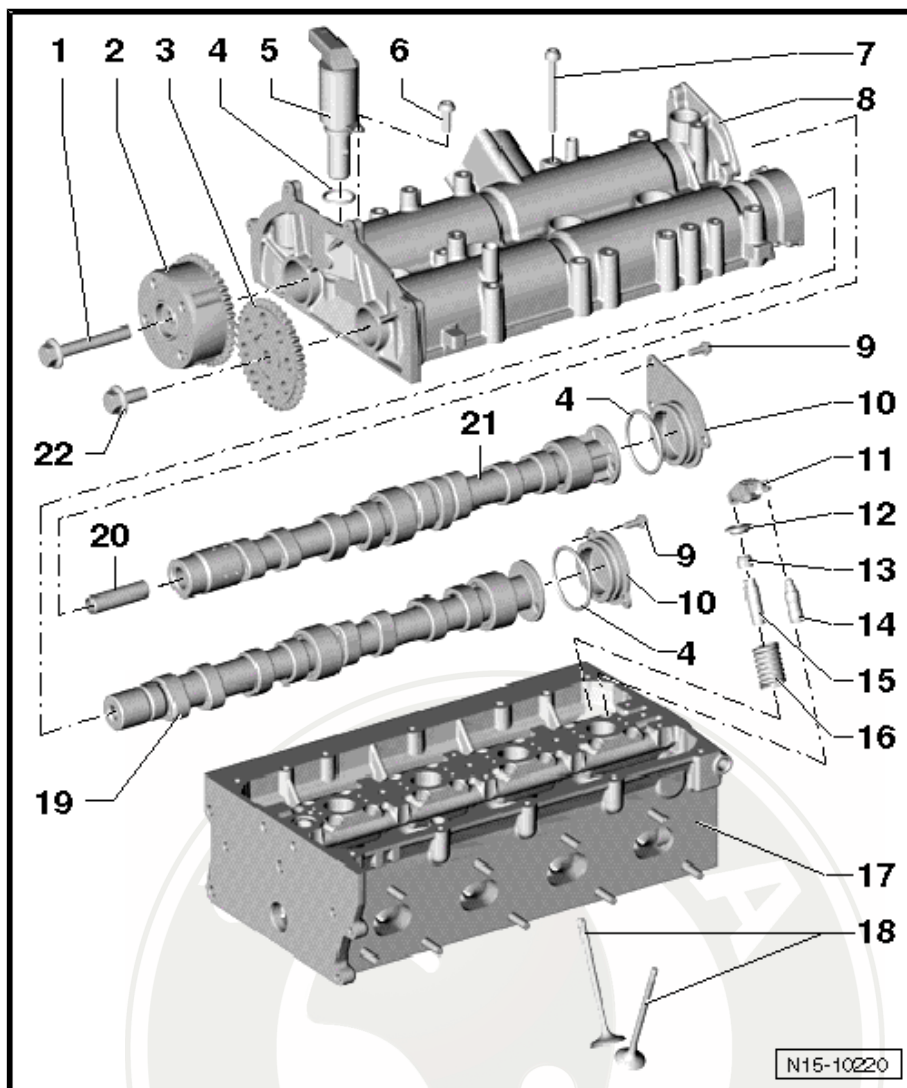
12 - Collets

13 - Valve stem seal

- ☐ replace

14 - Supporting element

- ☐ Check oil splash hole



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- ☐ with hydraulic valve clearance compensation
- ☐ do not interchange
- ☐ before installing check axial play of the camshaft ➔ [page 87](#)
- ☐ oil contact surfaces

15 - Valve guide

- ☐ check ➔ [page 90](#)

16 - Valve spring

- ☐ removing and installing ➔ [page 90](#)

17 - Cylinder head

- ☐ removing and installing ➔ [page 80](#)
- ☐ reworking valve seats ➔ [page 87](#)
- ☐ reworking sealing surface ➔ [page 86](#)

18 - Valves

- ☐ do not rework, only grinding in is permissible
- ☐ Valve dimensions ➔ [page 87](#)

19 - Exhaust camshaft

- ☐ do not mix up with inlet camshaft
- ☐ Inspecting axial play ➔ [page 87](#)
- ☐ moisten with oil before installing (also axial bearing collar)

20 - Guide bushing

21 - Inlet camshaft

- ☐ with cam for fuel-high pressure pump -arrow-
- ☐ before removing, remove the bucket tappet of the fuel-high pressure pump
- ☐ do not mix up with exhaust camshaft
- ☐ Inspecting axial play ➔ [page 87](#)
- ☐ moisten with oil before installing (also axial bearing collar)

22 - 50 Nm + torque a further 1/4 turn (90°)

- ☐ replace

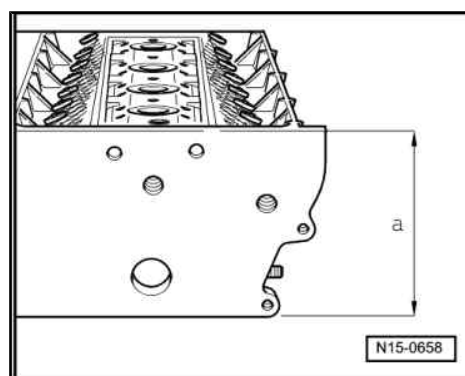
Reworking cylinder head sealing surface

Reworking dimension of cylinder head: a = at least 108.25 mm



Note

If the sealing surface is reworked, the valves should be set lower by the same amount (rework valve seat rings) otherwise the valves will strike the pistons. When doing this, ensure that the permissible minimum dimension is not exceeded ➔ [page 87](#).





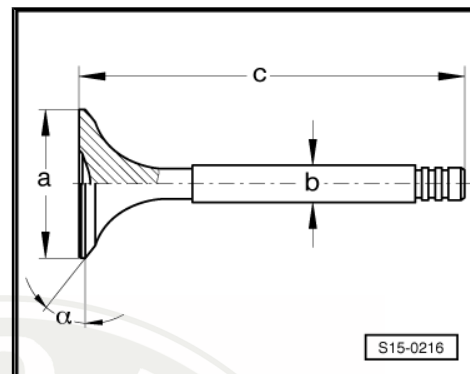
Valve dimensions



Note

Valves must not be reworked. Only grinding in is permissible.

Dimension		Inlet valve	Exhaust valve
$\varnothing a$	mm	29,5	26,0
$\varnothing b$	mm	5,973	5,953
c	mm	100,9	100,5
α	$^{\circ}$	45	45



3.2 Checking the axial play of the camshaft

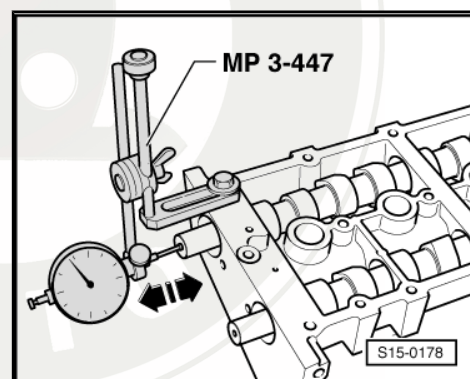
Special tools and workshop equipment required

- ◆ Universal dial gauge holder -MP 3-447 (VW 387)-
- ◆ Dial gauge

Carry out measurement with the camshaft housing removed and the end cover installed.

Checking the axial play of the camshaft

- Wear limit: 0.4 mm



3.3 Reworking valve seats

Special tools and workshop equipment required

- ◆ Depth gauge
- ◆ Valve seat machining device



Note

- ◆ When carrying out repairs on engines with leaking valves, it is not sufficient to machine or replace the valve seats and valves. It is also necessary to inspect the valve guides for wear, particularly on engines with a high mileage [⇒ page 90](#).
- ◆ Rework valve seats only sufficiently in order to obtain a proper contact pattern. Calculate the maximum permissible reworking dimension before commencing. If the reworking dimension is exceeded, the proper operation of the hydraulic valve clearance compensation is no longer ensured. If this is the case replace the cylinder head.

The maximum permissible reworking dimension can be calculated as follows:

- Insert valve and press firmly against the valve seat.



Note

If the valve is replaced when carrying out repair work, use a new valve for the measurement.

- Measure distance between the valve stem end and the upper face of the cylinder head.
- Calculate max. permissible reworking dimension from the distance measured and the minimum dimension.

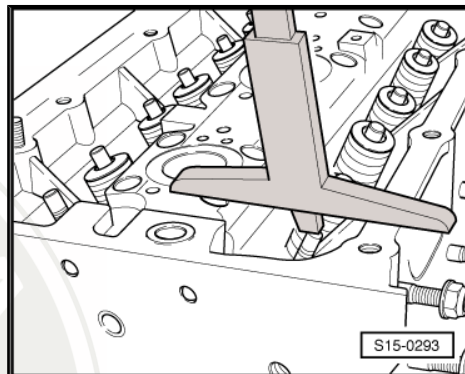
Minimum dimension: inlet valve	7.6 mm
Minimum dimension: outlet valve	7.6 mm

"Measured distance" - "minimum dimension" = "max. permissible reworking dimension".

Example:

Measured distance	8.0 mm
- Minimum dimension	7.6 mm
= max. permissible reworking dimension ¹⁾	0.4 mm

1) The max. permissible reworking dimension is shown in the figure for reworking the valve seats as dimension "b".



Reworking inlet valve seat

$a = \varnothing 28.7 \text{ mm}$.

b = max. permissible reworking dimension

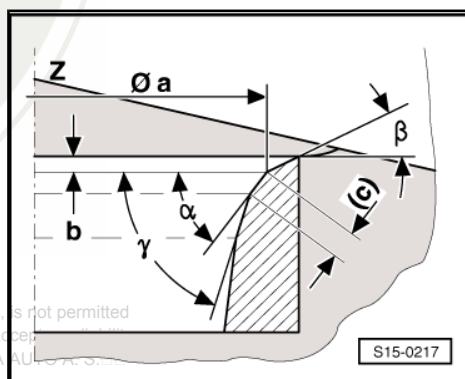
$c = 1.5 \dots 1.8 \text{ mm}$

Z = Bottom edge of cylinder head

$\alpha = 45^\circ$ valve seat angle

$\beta = 30^\circ$ top correction angle

$\gamma = 60^\circ$ bottom correction angle



Reworking exhaust valve seat

$a = \varnothing 25.0 \text{ mm}$.

b = max. permissible reworking dimension

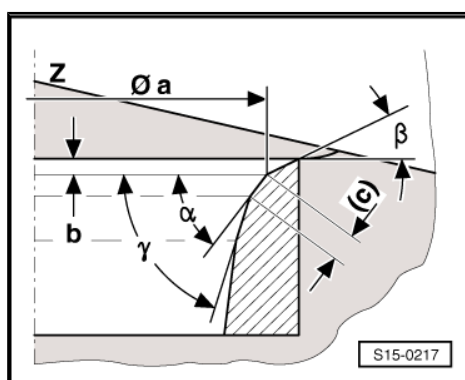
c = approx. 1.8 mm

Z = Bottom edge of cylinder head

$\alpha = 45^\circ$ valve seat angle

$\beta = 30^\circ$ top correction angle

$\gamma = 60^\circ$ bottom correction angle



Work procedure

Reworking can be carried out by hand while complying with the following conditions:

- The wear limit of the valve guides must not exceed the permissible dimension.
- Use NAC milling cutter with carbide metal tips (min. 90 HRC).
- Press on the milling cutter using slight pressure and mill in such a way that an even removal of swarfs is ensured over the whole working surface.



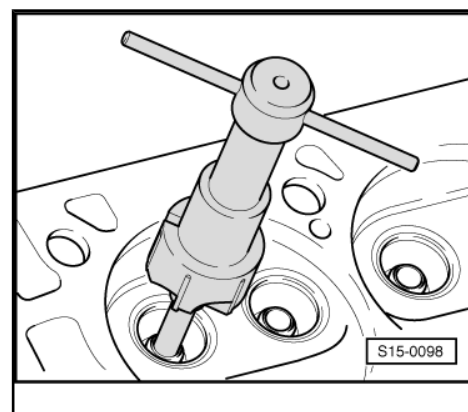
Reworking valve seats with NAC milling cutter

- Place cylinder head on a felt base and secure to prevent it from turning.
- Match diameter of guide drift to diameter of valve guide.

Valve guide	Guide drift Ø mm
Inlet valve	6,0 ^{-0,01}
Exhaust valve	

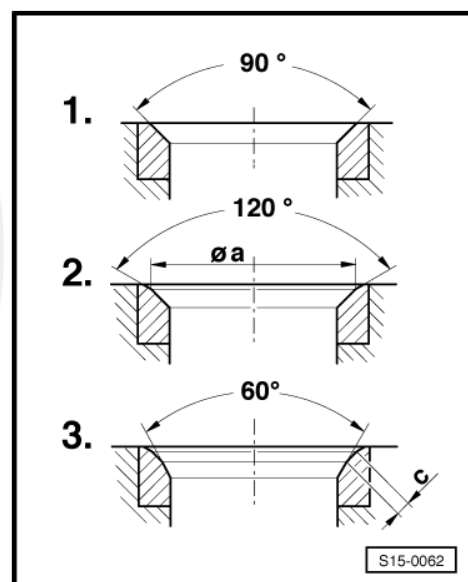
- Match diameter of milling cutter to diameter of valve seat.

Valve seat	Ø Milling cutter 90 mm	Ø Milling cutter 120 mm	Ø Milling cutter 60 mm
Inlet valve	32	32	21/34
Exhaust valve	30	30	21/34



Milling sequence

- 1 - Mill valve seat with 90° milling cutter until a perfect contact pattern is achieved. (Do not exceed maximum permissible reworking dimension!)
- 2 - Chamfer top correction angle with 120° milling cutter until valve seat diameter -a- is achieved ➤ [page 88](#) .
- 3 - Mill bottom correction angle with 60° milling cutter until valve seat width -c- is achieved ➤ [page 88](#) .



- Grind in valve/valve seat -arrows- with fine grinding paste so as to achieve a perfect contact pattern.

- Check contact pattern e.g. with water colour (perfect contact pattern over entire circumference).

- Install valve springs.

- Inspect valves for tightness.

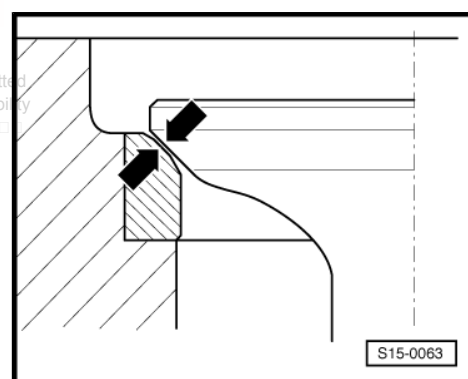
The tightness of the valves can be checked by filling petrol into the inlet and outlet canal (no petrol must flow out at the valve seat).

After completing the repair measure once again the distances between the valve stem ends and the upper face of the cylinder head and calculate the maximum permissible reworking dimension.



Note

If the maximum permissible reworking dimension is exceeded, proper operation of the valve gear is no longer assured and the cylinder head must be replaced.





3.4 Inspect valve guides

Special tools and workshop equipment required

- ♦ Universal dial gauge holder -MP 3-447 (VW 387)-
- ♦ Dial gauge

Work procedure



Note

If the valve is replaced when carrying out repair work, use a new valve for the measurement.

- Insert valve into guide. The end of valve stem must be flush with guide. Because of the different stem diameters only use inlet valve in inlet guide or outlet valve in outlet guide.
- Determine the valve rock by moving back and forward -arrows-.
- Wear limit: 0.8 mm

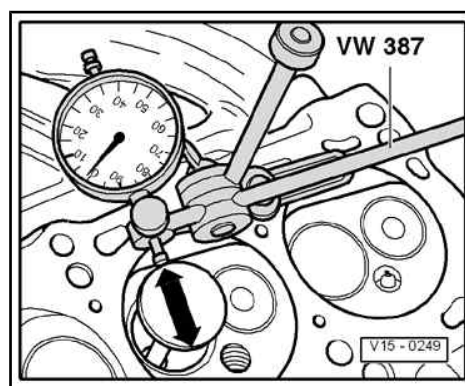


Note

If the wear limit is exceeded, repeat measurement with new valves.

If the valve rock is exceeded:

- Replace the cylinder head.



3.5 Replacing valve stem seals

Special tools and workshop equipment required

- ♦ Pressure hose -MP 1-210 (VW 653/3)-
- ♦ Valve lever -MP 1-211 (VW 541/1A/5) -
- ♦ Assembly device for valves -MP 1-213 (2036)-
- ♦ Valve supporting plate -MP 1-218 -
- ♦ Blank holder for valve spring -MP 1-229 (3362)- with pressure plate -MP 1-229/1 (3362/1)-
- ♦ Valve stem seal extractor -MP 1-230 (3364)-
- ♦ Valve stem seal insertion tool - MP 1-233 (3365)-

Removing



Note

With cylinder head removed, use valve lever -MP 1-211-, assembly device for valves -MP 1-213- and valve supporting plate -MP 1-218-.

(with cylinder head installed)

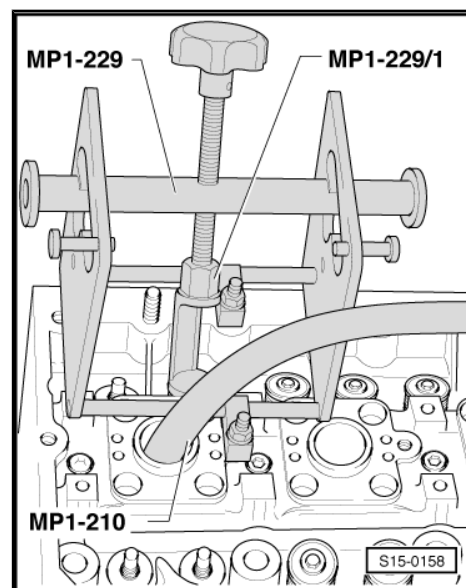
- Removing the camshaft housing ⇒ [page 75](#) .
- Remove roller rocker arm and place on a clean surface. Make sure the roller rocker arms are not interchanged.
- Unscrew the spark plugs with spark plug wrench.



- Put the piston of the relevant cylinder at “bottom dead centre”.
- Screw on blank holder for valve spring -MP 1-229- with pressure plate -MP 1-229/1- .
- Screw the pressure hose -MP 1-210- in the spark plug thread.
- Connect pressure hose to compressed air [min. 0.6 MPa (6° bar) overpressure] and remove the valve springs with blank holder for valve spring -MP 1-229- .
- Pull off valve stem seal with extractor for valve stem seal -MP 1-230- .

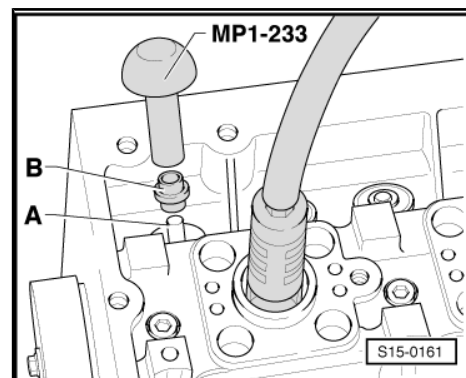
Install

- Insert the supplied plastic bushings on the relevant valve stem. This will prevent any damage to the new valve stem seals.



- Insert the new valve stem seal -B- in the insertion tool for valve stem seal -MP 1-233- .
- Oil the sealing lip of the valve stem seal and carefully slide onto the valve guide -A-.
- Installing camshaft housing ⇒ [page 75](#) .

Further installation occurs in a similar way in reverse order to removal.





17 – Lubrication

1 Lubrication system



Note

- ◆ *The oil level must not be above the max. marking - risk of damage to catalytic converter!*
- ◆ *If considerable quantities of metal swarf or abrasion is found when carrying out engine repairs, this can be subject to damage to the crankshaft and conrod bearings. In order to avoid consequential damage, after the repair perform the following tasks:*
 - Carefully clean the oil galleries.
 - Replace oil spray jets.
 - Replace engine oil cooler.
 - Replace oil filter.

Inspecting oil pressure ➔ [page 100](#) .



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Check the engine oil, amount of oil and oil specification ⇒ Maintenance ; Octavia II

1.1 Summary of components of lubrication system

Fitting location of the oil pressure switch -F1- and tightening torque ⇒ [page 95](#)

1 - Dipstick

- ☐ oil level must not exceed max. marking!

2 - Engine oil cooler

- ☐ removing and installing ⇒ [page 99](#)

3 - O-ring

- ☐ replace

4 - Coolant pipe

- ☐ for engine oil cooler
- ☐ Tightening torque bracket to the cylinder block: 20 Nm

5 - 8 Nm

6 - Screw cap

- ☐ Replace seal if damaged

7 - Sealing ring

- ☐ replace if damaged

8 - Oil filter, 20 Nm

- ☐ with gasket rings
- ☐ with non-return valve
- ☐ slacken and tighten with oil filter wrench -3417-
- ☐ Keep to change intervals ⇒ Maintenance ; Octavia II

9 - Timing case

- ☐ Removing and installing the timing case ⇒ [page 32](#)

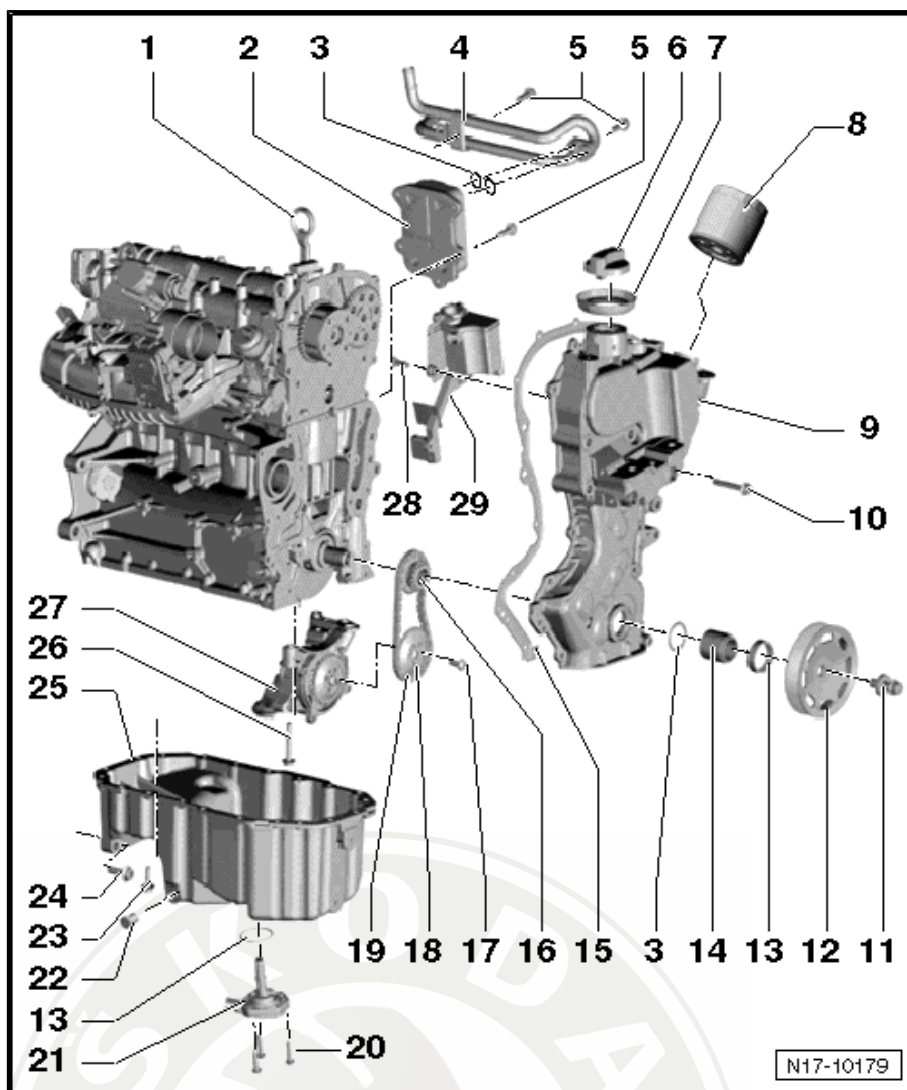
10 - 10 Nm

11 - 150 Nm + torque a further 180° (1/2 turn)

- ☐ replace
- ☐ removing and installing ⇒ ["3.4 Removing and installing crankshaft-belt pulley", page 40](#)
- ☐ The clamping surface of the fixing screw must be free of grease and oil.
- ☐ insert oiled (thread)
- ☐ Secure belt pulley with counterholder -T30004 (3415)- to prevent it from turning

12 - Belt pulley

- ☐ removing and installing ⇒ [page 40](#)
- ☐ Clamping surfaces must be free of oil and grease.
- ☐ Secure belt pulley with counterholder -T30004 (3415)- to prevent it from turning
- ☐ Removing and installing ribbed V-belt ⇒ [page 27](#)





13 - Sealing ring

- ☐ replace

14 - Bushing

- ☐ The clamping surfaces of the bushing must be free of grease and oil.

15 - Gasket

- ☐ replace if damaged

16 - Sprocket

- ☐ removing and installing ⇒ [page 67](#)
- ☐ for oil pump drive

17 - 20 Nm + torque a further 1/4 turn (90°)

- ☐ replace

18 - Sprocket

- ☐ removing and installing ⇒ [page 67](#)
- ☐ for oil pump
- ☐ counterhold with counterholder -T10172-

19 - Drive chain

- ☐ removing and installing ⇒ [page 67](#)
- ☐ for oil pump
- ☐ mark running direction (installed position) before removing

20 - 10 Nm

21 - Oil level and oil temperature sender -G266 -

- ☐ replace if damaged
- ☐ check: ⇒ Current flow diagrams and Fitting locations

22 - Oil drain plug, 30 Nm

- ☐ with captive seal
- ☐ replace

23 - 13 Nm

- ☐ replace
- ☐ slacken and tighten only the bolts at the gearbox side with socket insert -T10058-

24 - 40 Nm

25 - Oil pan

- ☐ removing and installing ⇒ [page 95](#)

26 - 25 Nm

27 - Oil pump

- ☐ must be replaced completely

28 - 5 Nm

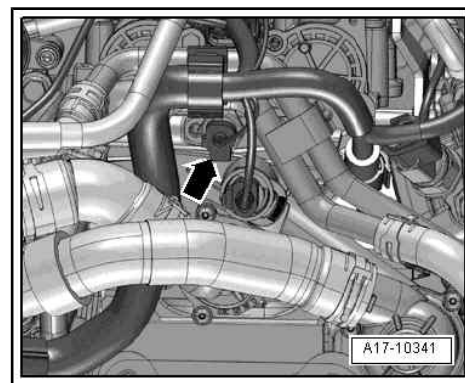
29 - Oil separator



Fitting location of the oil pressure switch -F1- and tightening torque

The oil pressure switch -F1- -arrow- is located on the left of the cylinder head below both camshaft caps.

- Tighten oil pressure switch -F1- -arrow- to 20 Nm.



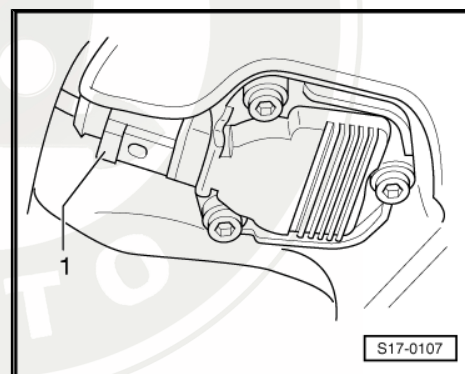
1.2 Removing and installing oil pan

Special tools and workshop equipment required

- ◆ Socket insert -T10058-
- ◆ Sealant remover gasket stripper (bearing code GST, bearing article no. R 34402), manufacturer Retech s.r.o.
- ◆ Cleaning and degreasing agent , e.g. -D 000 401 04-
- ◆ Silicone sealant -D 176 600 A1-

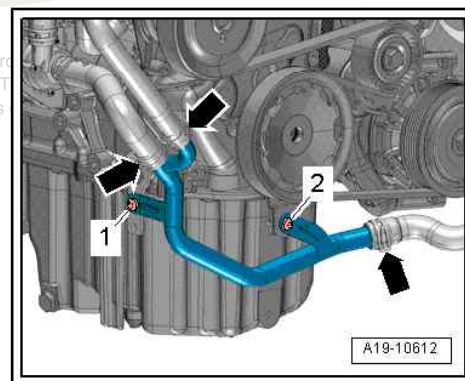
Removing

- Remove noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Drain engine oil ⇒ Maintenance ; Octavia II .
- Remove exhaust pipe ⇒ [page 194](#) .
- Disconnect plug at oil level and oil temperature sender - G266- .
- Unscrew screws of oil pan/gearbox.



- Unscrew screws -1- (8 Nm) and -2- (8 Nm) and press the right coolant pipe to the side.

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- Release screws of oil pan/gearbox -arrows-.
- Loosen screws for oil pan -1- crosswise and release.



Note

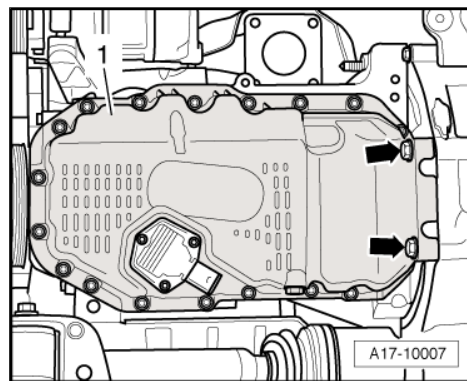
Slacken the bolts at the gearbox side with socket insert -T10058

- Remove oil pan, if necessary release by applying slight blows with a rubber-headed hammer.



WARNING

Wear protective gloves when working with sealant and grease remover!



- Remove the remaining sealant on the cylinder block and on the oil pan with chemical sealant remover.
- Degrease the sealing surfaces.

Install



Note

- ◆ *Replace M6 oil pan bolts.*
- ◆ *Pay attention to the use by date on sealant.*
- ◆ *The oil pan must be installed within 5 minutes after applying the silicone sealant.*

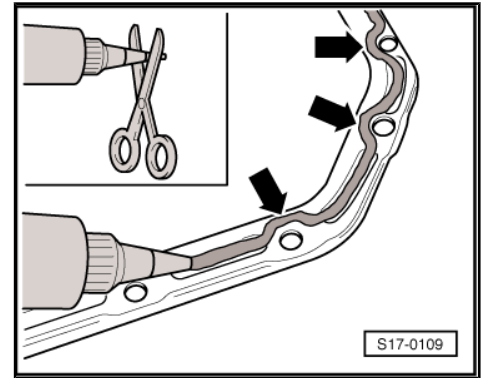




- Cut off nozzle tube at the front marking ($\varnothing$ of nozzle approx. 3 mm).
- Apply silicone sealant to the clean sealing surface of the oil pan, as shown in the illustration. The sealant bead must be:
 - ◆ be 2...3 mm thick
 - ◆ run past the area around the bolt holes on the inside -arrows-

i Note

The sealant bead must not be thicker otherwise excess sealant may get into the oil pan and block the strainer in the oil suction pipe.



- Fit oil pan immediately and slightly tighten 2 opposite oil pan bolts.

i Note

- ◆ *When installing the oil pan with the engine removed, ensure that the oil pan is flush with the cylinder block at the flywheel side.*
- ◆ *Pay attention when inserting the oil pan bolts on the flywheel side that the oil pan bolts are inserted in the holes and not between the cylinder block and the flywheel.*
- ◆ *If the oil pan bolts are inadvertently inserted between the cylinder block and the flywheel and can no longer be pulled out, the oil pan must be removed again, the sealing surfaces must be cleaned and the silicone sealant must be replaced.*

- Then slightly tighten both M6 oil pan bolts on the flywheel side.
- Slightly rotate both M10 screws for oil pan/gearbox.
- Slightly tighten the remaining oil pan bolts.
- Tighten the oil pan bolts.

Screws M6: 13 Nm

Screws M10: 40 Nm

i Note

After installing the oil pan, allow the sealant to dry for about 30 minutes. Only then may engine oil be filled in.

1.3 Removing and installing oil pump

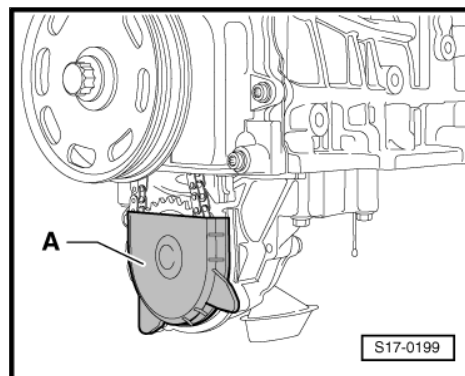
Special tools and workshop equipment required

- ◆ Counterholder -T10172-

Removing

- Removing the oil pan ⇒ [page 95](#) .

- Unclip the cover for the chain sprocket of the oil pump -A-.

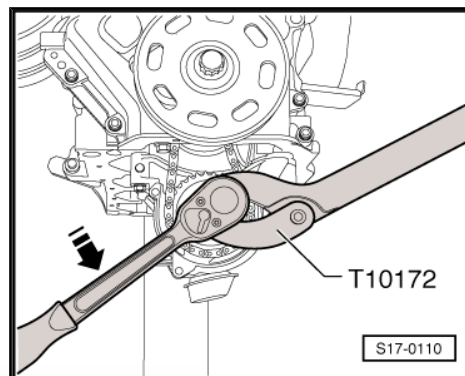


- Hold the chain sprocket of the oil pump with the counterholder -T10172- .
- Release the fixing screw of the chain sprocket.

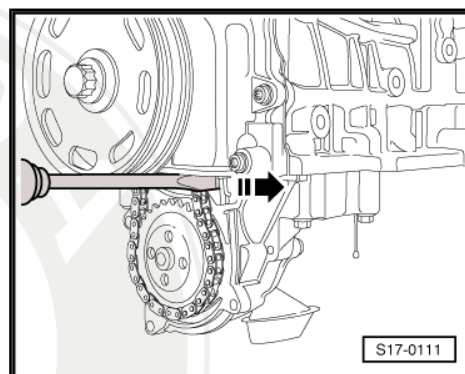


Note

Do not unscrew the bolt yet.

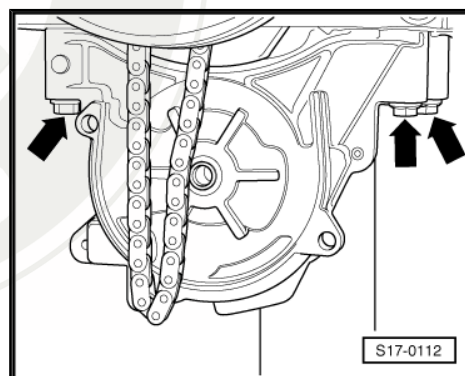


- Press chain tensioner with a screwdriver in -direction of arrow-.
- Release the fixing screw of the chain sprocket.
- Remove the chain sprocket from the oil pump and from the chain.



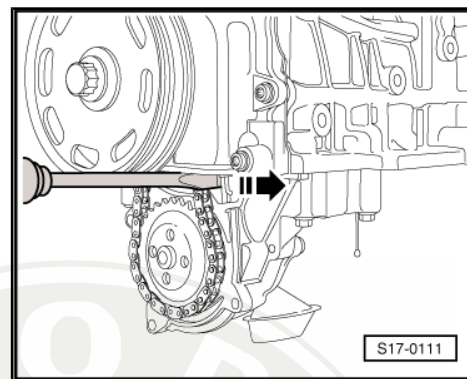
- Unscrew fixing bolts of the oil pump -arrows-.
- Remove the oil pump from the cylinder block.

Install

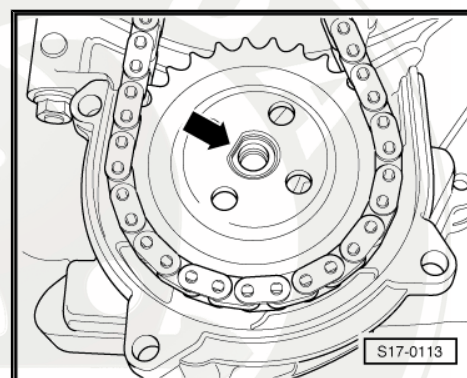


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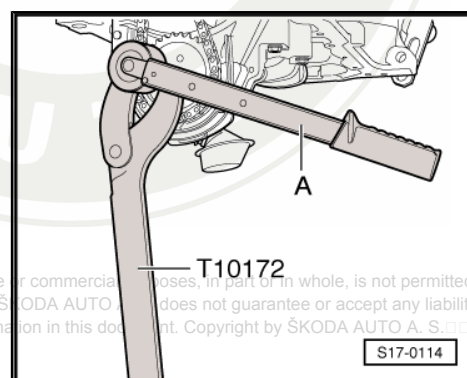
- Press chain tensioner with a screwdriver in -direction of arrow-.
- Insert the chain sprocket into the chain and position on the shaft of the oil pump.



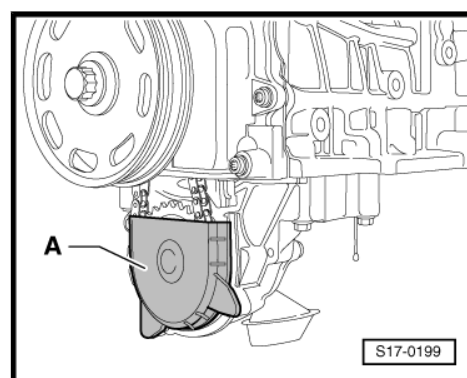
- Pay attention to the seating of the chain sprocket on the shaft of the oil pump -arrow-.
- Screw in new fixing screw for chain sprocket.



- Counterhold the chain sprocket with the counterholder - T10172 - .
- Position the torque wrench -A- as shown.
- Tighten fixing bolt to 20 Nm + torque a further + 90° (1/4 turn).



- Install the cover for the chain sprocket of the oil pump -A-.
- Installing the oil pan ⇒ [page 95](#) .



1.4 Removing and installing engine oil cooler

Special tools and workshop equipment required

- ◆ Catch pan for workshop crane e.g. -VAS 6208-

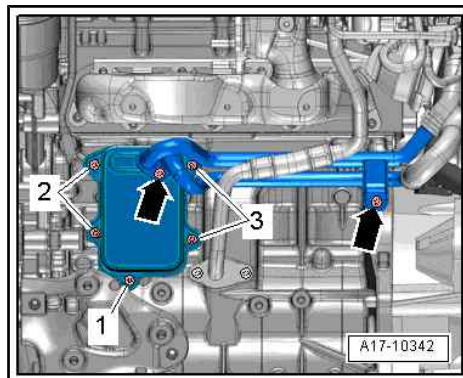
Removing

- Drain the coolant from the engine cooling system
⇒ [page 103](#) .
- Remove the generator ⇒ Electrical System; Rep. Gr. 27 .
- Unscrew screws -arrows- for coolant pipes at cylinder block and at engine oil cooler.
- Place a catch pan for engine oil under the engine.
- Pull out the coolant pipes towards the front out of the engine oil cooler.
- Unscrew screws -1, 2, 3- and pull off the engine oil cooler from the cylinder block.



Note

To provide a clearer illustration, the fitting position is illustrated with the catalytic converter removed.



Install

- ◆ Tightening torques: ⇒ [page 93](#)

Installation is performed in the reverse order, pay attention to the following points:



Note

Replace O-rings.

- Install generator ⇒ Electrical system; Rep. Gr. 27 .
- Top up coolant ⇒ [page 103](#) .



Note

If the engine oil cooler was replaced, the coolant must be changed.

1.5 Testing oil pressure and oil pressure switch

Special tools and workshop equipment required

- ◆ Flexible-head wrench SW 24 - T40175 -
- ◆ Oil pressure tester , e.g. -V.A.G 1342-
- ◆ Voltage tester , e. g. -V.A.G 1527 B-
- ◆ Measuring tool set , e.g. -V.A.G 1594 C-
- ◆ Vehicle Diagnosis, Measurement and Information System - VAS 505X-

Conditions

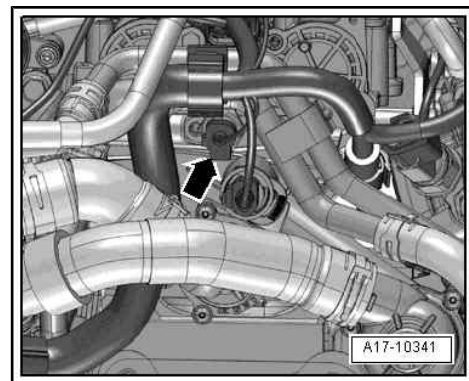
- Engine oil level o.k., test ⇒ Maintenance ; Octavia II .
- Coolant temperature at least 80°C (radiator fan must have run at least once)

 Note

Functional test and repair of the visual and acoustic oil pressure display ⇒ Current flow diagrams and Fitting locations, ⇒ Vehicle diagnosis, testing and information system VAS 5051.

Test sequence

- Remove the oil pressure switch in the left cylinder head -arrow- with the flexible-head wrench, wrench size 24 - T40175- .



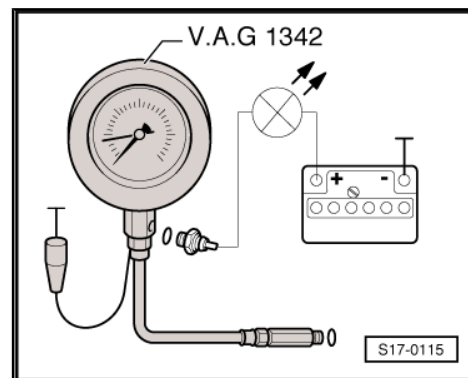
- Screw oil pressure switch into the test equipment.
- Screw tester in the cylinder head instead of the oil pressure switch.
- Connect brown cable of tester to earth (-).
- Connect voltage tester to battery positive and to oil pressure switch.
- The LED must not light up.

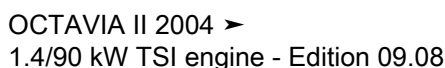
If the LED lights up:

- Replace oil pressure switch - F1- .

If the LED does not light up:

- Start engine and slowly increase engine speed.
- The LED must light up at an oil overpressure of 0.03...0.07 MPa (0.3...0.7 bar), if not replace oil pressure switch.
- Increase engine speed further.
- At 2000 rpm and an oil temperature of 80°C the oil overpressure should be at least 0.2 MPa (2.0 bar).
- At a higher engine speed the oil overpressure must not be greater than 0.7 MPa (7 bar).





1 Cooling system



- ◆ *Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding.*
- ◆ *Cover the cap with a cloth and open carefully.*



- ◆ *When the engine is warm the cooling system is under pressure. If necessary reduce pressure before repairs.*
- ◆ *The hose connections are secured with spring-type clips. In case of repair only assign the spring strap clamps via the ⇒ Electronic catalogue of original parts .*
- ◆ *Use pliers for spring strap clamps to fit the spring strap clips.*
- ◆ *Always replace seals and gasket rings.*
- ◆ *When installing fit the coolant hoses free of stress, without them touching any other components (pay attention to the marking on the coolant connection and hose).*
- ◆ *The arrows which are on the coolant pipes and the coolant hose ends must stand opposite to each other.*

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1.1 Connection diagram for coolant hoses

- ◆ Engine cooling system (bright coloured components)
- ◆ Charge air cooling system (dark coloured components)

The expansion reservoir supplies both cooling systems.

1 - Expansion reservoir

2 - Coolant recirculation pump -V50-

- ☐ removing and installing
⇒ [page 108](#)

3 - Charge air cooler

- ☐ in the intake manifold
⇒ [page 162](#)

4 - Non-return valve

- ☐ in the coolant hose, not visible from the outside

5 - Heat exchanger for heating

6 - Coolant regulator housing

7 - Throttle valve

- ☐ in the coolant hose, not visible from the outside

8 - Engine oil cooler

9 - Radiator

10 - Additional radiator for coolant of charge air system

11 - Exhaust gas turbocharger

- ☐ removing and installing
⇒ [page 149](#)

12 - Cylinder head/cylinder block

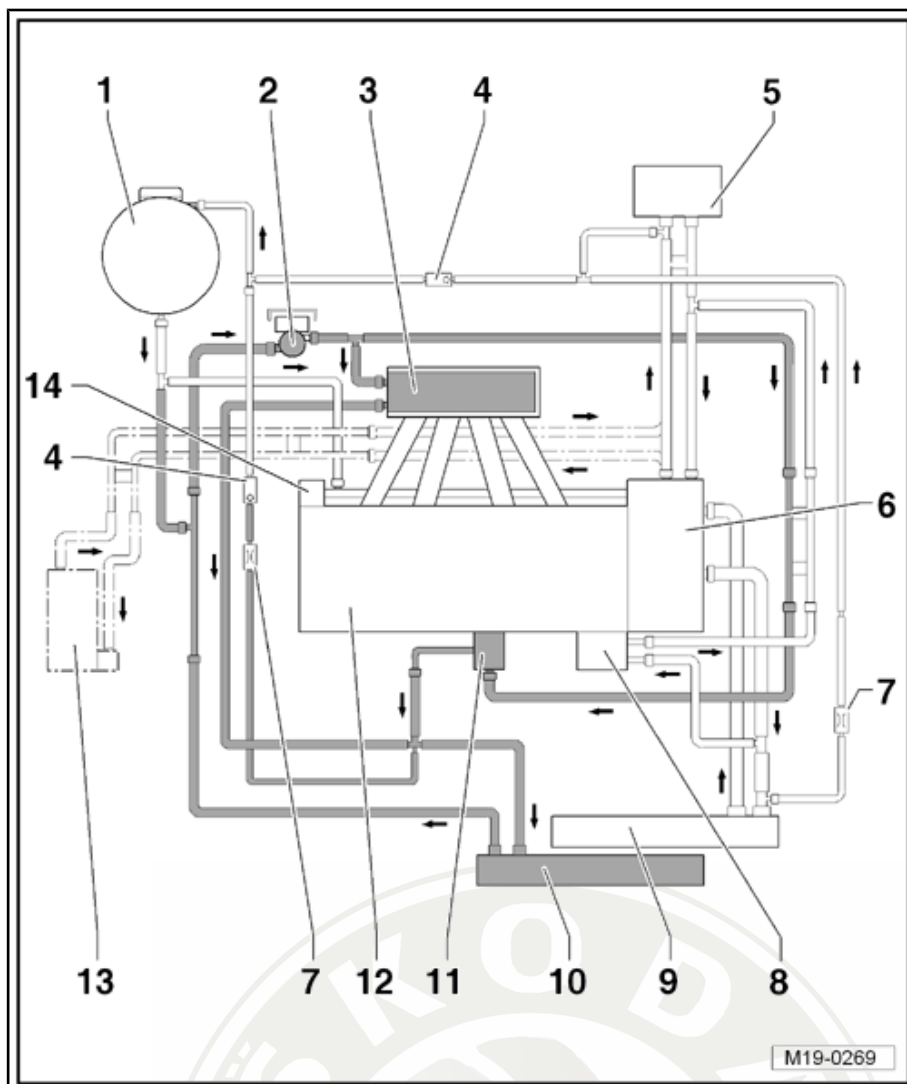
- ☐ fill with fresh coolant after replacing

13 - Auxiliary heating

- ☐ only for vehicles with special equipment

14 - Coolant pump

- ☐ removing and installing ⇒ [page 107](#)



1.2 Draining and filling up coolant

Special tools and workshop equipment required

- ◆ Catch pan for workshop crane e.g. - VAS 6208-
- ◆ Pliers for spring strap clamps
- ◆ Refractometer -T10007- or -T10007A-

Draining



Note

- ◆ *Collect drained coolant in a clean container for reuse or proper disposal.*

- ◆ *Observe the disposal instructions.*

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WARNING

Hot steam may escape when the compensation bottle is opened.

- ◆ *Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding.*
- ◆ *Cover the cap with a cloth and open carefully.*

- Open compensation bottle.
- Remove noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Place a catch pan under the radiator.



Note

- ◆ *Depending on the components which must be removed ⇒ [page 102](#) , the coolant from the engine cooling system, from the charge air cooling system or from both cooling systems must be drained.*
- ◆ *If the coolant must be replaced, it should be drained from both cooling systems.*

Drain the coolant from the engine cooling system

- Open spring strap clamp -arrow- and pull off the coolant hose from the bottom radiator connection.

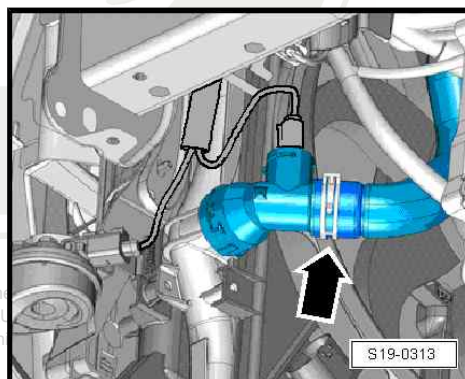
If the quick coupling is disconnected at the bottom coolant fitting, a lot of coolant flows onto the shock absorber cover.



Note

Please observe all disposal instructions!

Drain the coolant from the charge air cooling system





- Separate the coolant hose (quick coupling) -arrow- on the bottom connection fitting of the additional radiator for coolant of charge air system.



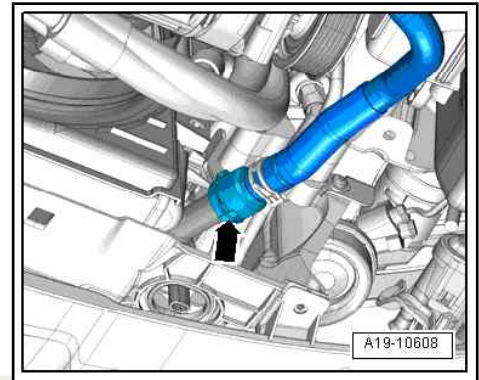
Note

Please observe all disposal instructions!

Top up and bleed cooling system.

Select the appropriate coolant additive from the ⇒ Electronic Catalogue of Original Parts or from the list of allowed coolant additives ⇒ Maintenance ; Octavia II .

- In a clean reservoir mix water and coolant additive in the specified mixing ratio ⇒ Maintenance ; Octavia II .
- Reposition the removed coolant hose onto the relevant support.
- Install the noise insulation ⇒ Body Work; Rep. Gr. 50 .
- Switch off the air-conditioning system and the heating.



Caution

In order to secure the refrigerating capacity of the charge air cooling system, the following work steps must absolutely be observed.

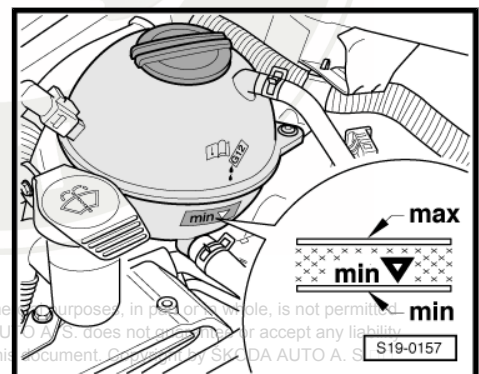
- Fill up the coolant slowly up to the top marking of the criss-crossed field (max.) on the expansion reservoir.
- Seal expansion reservoir.
- Start the engine and maintain the engine speed for about 3 minutes at approx. 2000 r.p.m.
- Run engine until radiator fan -V7- starts.



WARNING

Hot steam may escape when the compensation bottle is opened.

- ◆ *Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding.*
- ◆ *Cover the cap with a cloth and open carefully.*



- Check the level of coolant when the expansion reservoir is closed and top up if necessary when the engine is cooled down.
- When engine is at operating temperature the coolant level must be at the max. marking, when engine is cold between the min. and the max. markings.

2 Coolant pumps, coolant regulator

2.1 Coolant pump - Summary of components

- 1 - Coolant hose
- 2 - 8 Nm
- 3 - Coolant recirculation pump -V50-

☐ removing and installing
⇒ [page 108](#)

- 4 - Coolant hose

- 5 - Support

- 6 - Coolant pump

☐ removing and installing
⇒ [page 107](#)

☐ with integrated gasket ring

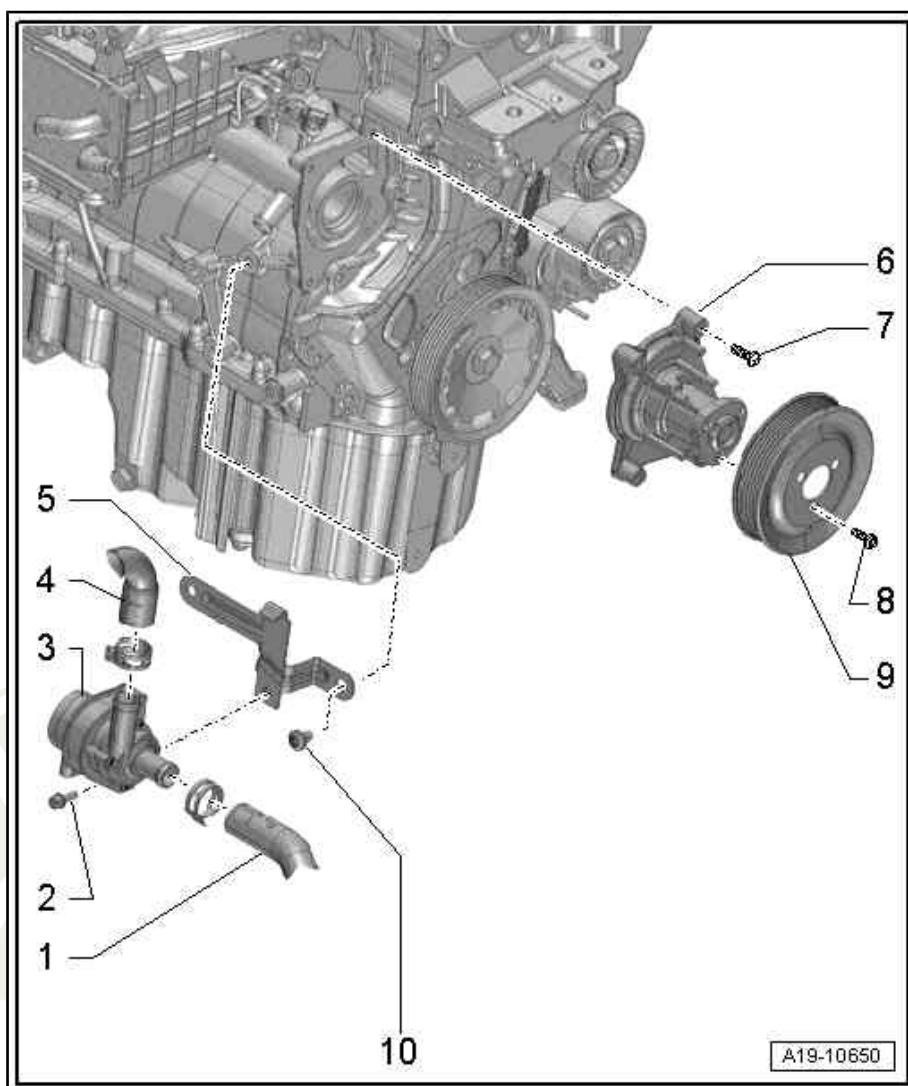
- 7 - 9 Nm

- 8 - 20 Nm

- 9 - Belt pulley for coolant pump

☐ removing and installing
⇒ [page 106](#)

- 10 - 20 Nm



2.2 Removing and installing belt pulley for coolant pump

Special tools and workshop equipment required

- ◆ Wrench for the water pump and power-assisted steering -MP 1-308 (V.A.G 1590) -

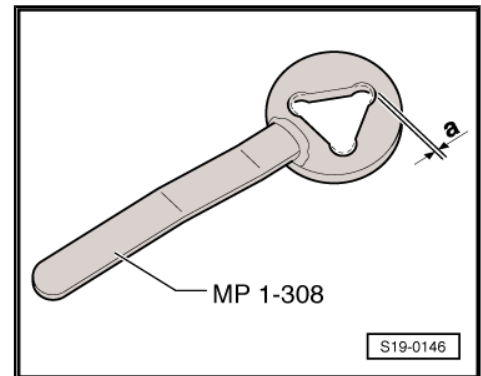
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Change wrench for the water pump and power-assisted steering -MP 1-308 -

- Because of modified fixing screws for the belt pulley of the coolant pump, these three curvatures must be filed open.
 - a- at least 1 mm

Removing

- Remove V-ribbed belt ⇒ [page 27](#) .

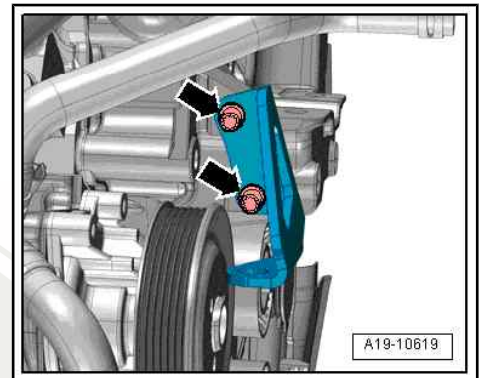


- Release screws -arrows- and remove holder from timing case.



Note

The bracket at the timing case only serves as transport security of the engine before the first installation and must not be refitted.

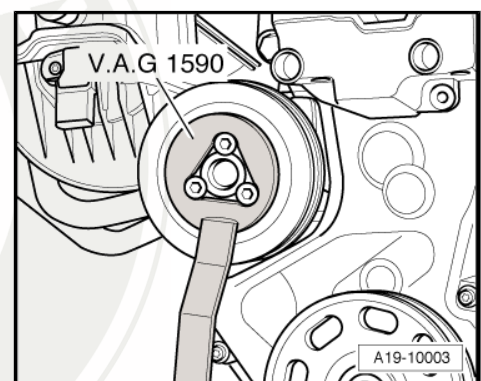


- Release the screws for the belt pulley for coolant pump, to do so counterhold with wrench for the water pump and power-assisted steering -V.A.G 1590 - .

Install

Installation is performed in the reverse order, pay attention to the following points:

- ◆ Tightening torque: ⇒ [page 106](#)



2.3 Removing and installing coolant pump

Special tools and workshop equipment required

- ◆ Catch pan for workshop crane e.g. - VAS 6208-

Removing



Note

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- ◆ *The integrated gasket of the coolant pump must not be separated from the coolant pump.*
- ◆ *If damage and leak present, replace coolant pump with gasket completely.*
- Drain the coolant from the engine cooling system ⇒ [page 103](#) .
- Remove belt pulley for control pump ⇒ [page 106](#) .

- Release screws -arrows- and remove coolant pump.

Install

Installation is performed in the reverse order, pay attention to the following points:

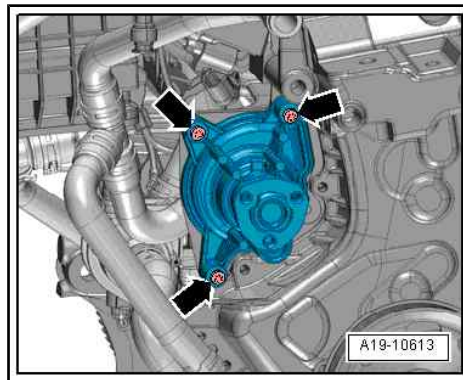
- ♦ Tightening torque: ➔ [page 106](#)



Note

Replace O-ring.

- Clean sealing surface for O-ring and smoothen.
- Moisten O-ring with coolant.
- Install belt pulley for coolant pump ➔ [page 106](#) .
- Top up and bleed cooling system ➔ [page 103](#) .



2.4 Removing and installing coolant recirculation pump -V50-

Special tools and workshop equipment required

- ♦ Hose clamps up to 25 mm -MP7-602 (3094)-
- ♦ Pliers for spring strap clamps
- ♦ Catch pan for workshop crane e.g. - VAS 6208-

Removing

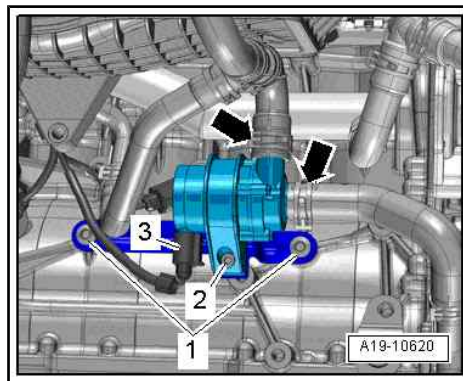
- Remove noise insulation ➔ Body Work ➔ Rep. Gr. 50 .
- Unplug connector -3-.
- Release screw -2- and remove coolant recirculation pump - V50- from bracket.
- Place a catch pan under the engine.
- Pinch off the coolant hoses with the hose clamps -MP7-602- and remove them from the coolant recirculation pump -V50- .

Install

- ♦ Tightening torques ➔ [page 106](#) .

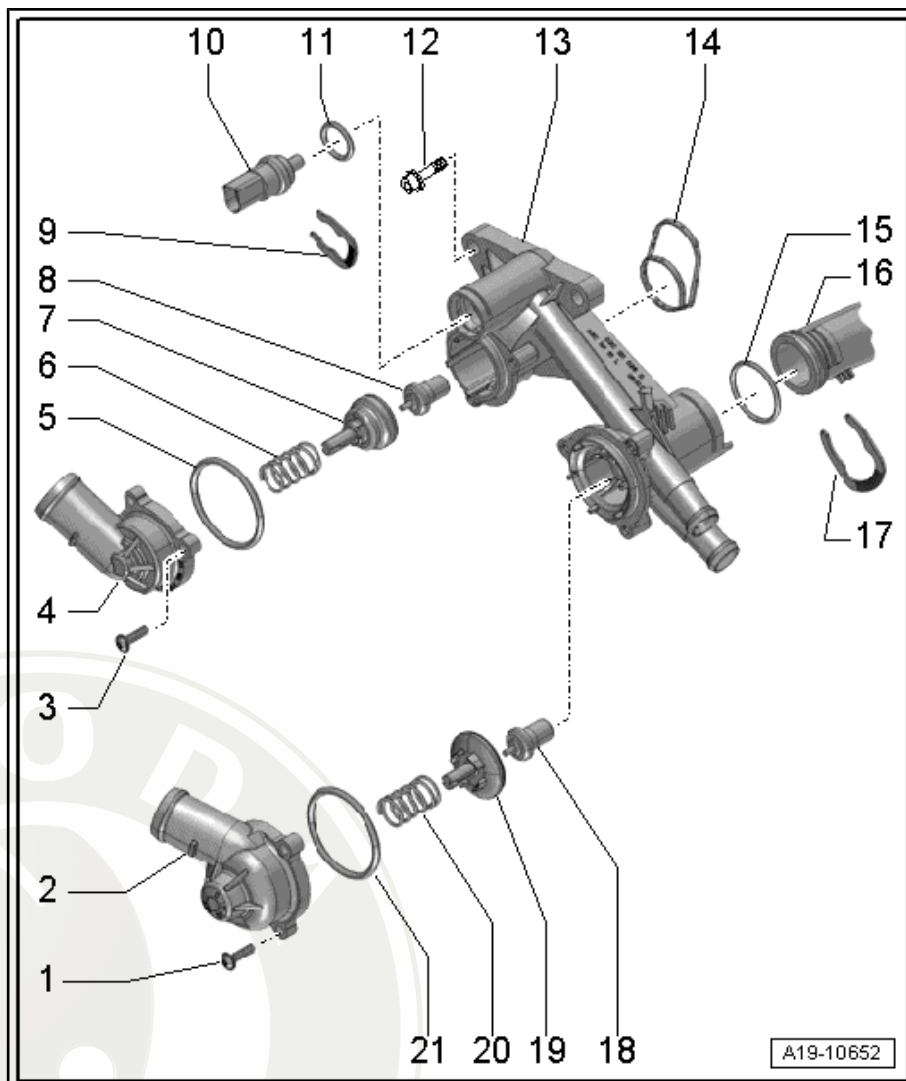
Installation is performed in the reverse order, pay attention to the following points:

- Inspect coolant level, if necessary top up cooling system and bleed ➔ [page 103](#) .



2.5 Summary of components of coolant regulator

- 1 - 5 Nm
- 2 - Connection fittings
- 3 - 5 Nm
- 4 - Connection fittings
- 5 - O-ring
 - ☐ replace
- 6 - Pressure spring
- 7 - Tappet
 - ☐ do not tilt when installing
- 8 - Thermo-element for coolant regulator 105°C
 - ☐ do not interchange with position 18
 - ☐ Regulating mode: 105 ... 120 °C
 - ☐ Opening stroke: at least 8 mm
- 9 - Clamp
 - ☐ check tightness
- 10 - Coolant temperature sender -G62-
 - ☐ before removing, reduce pressure in cooling system if necessary
- 11 - O-ring
 - ☐ replace
- 12 - 11 Nm
 - ☐ self-locking, replace
- 13 - Coolant regulator housing
- 14 - Gasket
 - ☐ replace
- 15 - O-ring
 - ☐ replace
- 16 - Coolant pipe
- 17 - Retaining clip for coolant pipe
- 18 - Thermo-element for coolant regulator 83°C
 - ☐ do not interchange with position 8
 - ☐ Regulating mode: 83 ... 98°C
 - ☐ Opening stroke: at least 8 mm
- 19 - Tappet
 - ☐ do not tilt when installing
- 20 - Pressure spring
- 21 - O-ring
 - ☐ replace



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3 Radiator and radiator fan

3.1 Parts of cooling system on the side next to the body - Summary of components



Note

This engine is equipped with an additional radiator for coolant of charge air system ➔ [page 162](#).

1 - Radiator

- ☐ removing and installing
➔ [page 112](#)
- ☐ after replacing fill entire system with fresh coolant

2 - O-ring

- ☐ replace if damaged

3 - Top coolant hose

- ☐ To connection fitting at cylinder head
- ☐ connection diagram for coolant hoses
➔ [page 102](#)

4 - Coolant hose

- ☐ to the expansion reservoir

5 - Spring strap clamp

- ☐ use spring strap clips ,
e.g. -VAS 6340- , for removing and installing

6 - Coolant hose

- ☐ to coolant pipe for additional radiator for coolant of charge air system

7 - Connecting pipe

8 - Expansion reservoir

- ☐ with coolant shortage warning light sender - G32-
- ☐ Check the cooling system for tightness
➔ [page 113](#)

9 - Connector

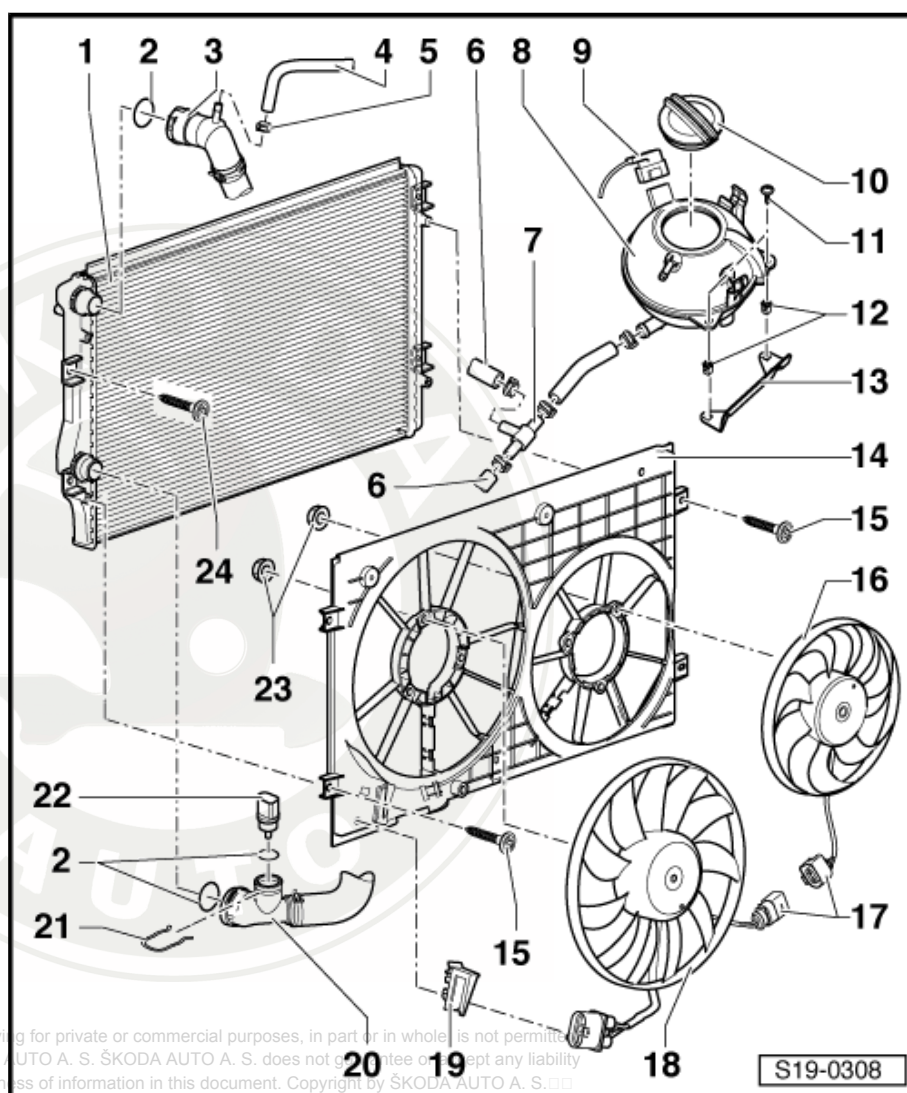
10 - Screw cap

- ☐ Testing the pressure relief valve in the cap ➔ [page 113](#)

11 - 3 Nm

12 - Plastic inserts

- ☐ for fixing screws



13 - Support

14 - Fan shroud

- ❑ removing and installing ⇒ [page 111](#)

15 - 5 Nm

16 - Right radiator fan -V35-

- ❑ removing and installing ⇒ [page 111](#)

17 - Connector

18 - Radiator fan -V7-

- ❑ with radiator fan control unit -J293-
- ❑ removing and installing ⇒ [page 111](#)

19 - Support

- ❑ for connector

20 - Bottom coolant hose

- ❑ to the connection fitting for the coolant regulator

21 - Clamp

- ❑ check tightness

22 - Coolant temperature sender at radiator outlet -G83-

23 - 5 Nm

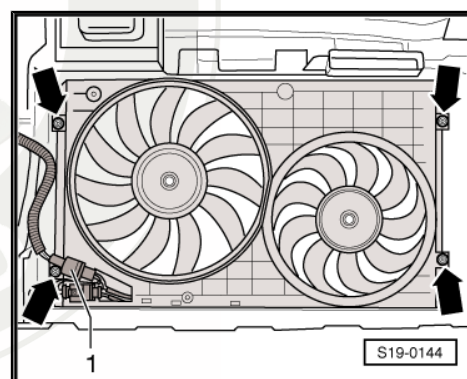
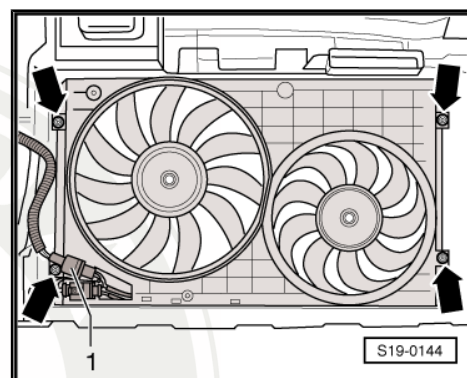
24 - 5 Nm

- ❑ Fitted to additional radiator for coolant of charge air system ⇒ [page 162](#)

3.2 Removing and installing fan shroud for radiator fan -V7- and -V35-

Removing

- Remove air filter ⇒ [page 176](#) .
- Unscrew the top fixing screws of the fan shroud -arrows-.
- Remove noise insulation ⇒ Body Work ⇒ Rep. Gr. 50 .
- Disconnect the plug connection -1- and unscrew the bottom fixing screws of the fan shroud -arrows-.
- Take out fan shroud downwards.





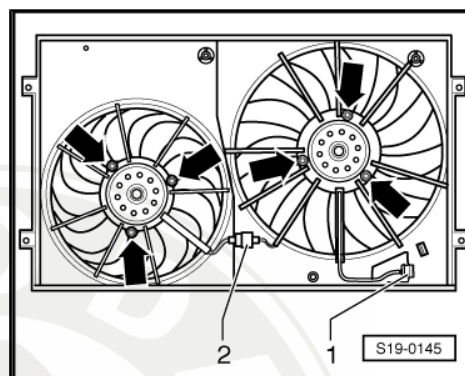
- Separate plug connection -2- and expose cable.
- Disconnect the plug connection -1- from the fan shroud and expose cable.
- Unscrew the nuts -arrows- and remove the fan.

Install

Installation is performed in the reverse order, pay attention to the following points:

Tightening torques:

Component	Nm
Radiator fan at fan shroud	5
Fan shroud at radiator	5



3.3 Removing and installing radiator

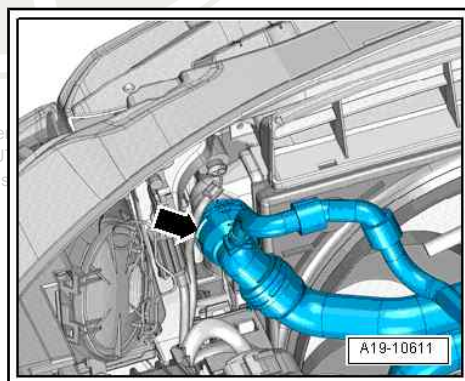
Special tools and workshop equipment required

- ◆ Catch pan for workshop crane e.g. - VAS 6208-
- ◆ Pliers for spring strap clamps

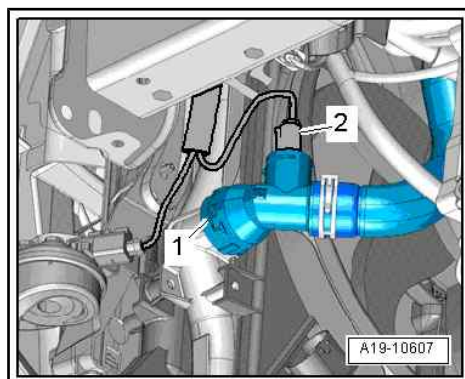
Removing

- Drain the coolant from the engine cooling system
⇒ [page 103](#) .
- Removing fan shroud ⇒ [page 111](#) .
- Remove top left coolant fitting from radiator, to do so raise the retaining clip -arrow-.

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- Unplug connector -2-.
- Detach the bottom coolant fitting -1- from the radiator.



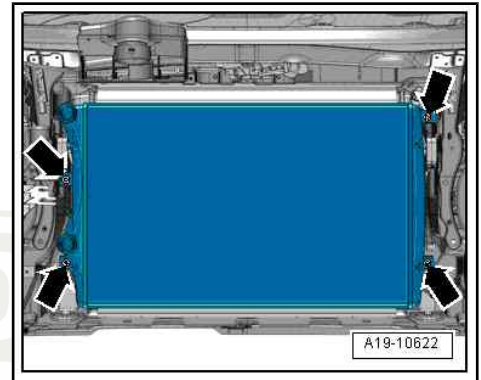


- Screw out screws -arrows- and take out radiator downwards.

Install

Installation is performed in the reverse order, pay attention to the following points:

- Top up and bleed cooling system ➔ [page 103](#) .



3.4 Checking the coolant system for leak-tightness

3.4.1 Inspecting coolant system with coolant system tester -V.A.G 1274- for tightness

Special tools and workshop equipment required

- ◆ Coolant system tester e.g. -V.A.G 1274-
- ◆ Adapter for coolant system tester , e.g.° -V.A.G 1274/8-
- ◆ Adapter for coolant system tester , e.g.° -V.A.G 1274/9-

Test condition

- Engine must be warm.

Test sequence



WARNING

Hot steam may escape when the compensation bottle is opened.

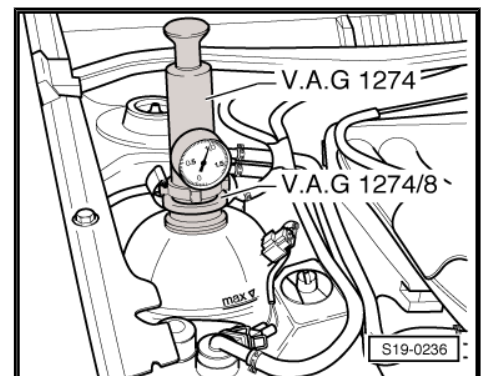
- ◆ ***Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding.***
- ◆ ***Cover the cap with a cloth and open carefully.***

- Open compensation bottle.
- Position the cooling system testing device -V.A.G 1274- with adapter -V.A.G 1274/8- on the coolant expansion reservoir.
- Using the hand pump of the testing device generate an over-pressure of approx. 0.1 MPa (1.0 bar).

If the pressure drops:

- Determine position of the leak and repair fault.

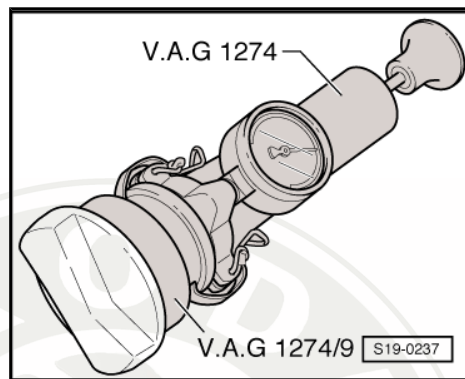
Testing the pressure relief valve in the cap



- Position the cooling system testing device -V.A.G 1274- with adapter -V.A.G 1274/9- on the cap.
- Operate the handpump.
- The pressure relief valve should open at a pressure of 0.14...0.16 MPa (1.4...1.6 bar).

If the pressure relief valve opens too early or too late:

- Replace cap.



3.4.2 Inspecting coolant system with coolant system tester -V.A.G 1274 B- for tightness

Special tools and workshop equipment required

- ◆ Coolant system tester e.g. -V.A.G 1274 B-
- ◆ Adapter for coolant system tester , e.g. ° -V.A.G 1274/8-
- ◆ Adapter for coolant system tester , e.g. ° -V.A.G 1274/9-

Test condition

- Engine must be warm.

Test sequence



WARNING

Hot steam may escape when the compensation bottle is opened.

- ◆ ***Wear safety goggles and safety clothing, in order to avoid eye injuries and scalding.***
- ◆ ***Cover the cap with a cloth and open carefully.***

- Open compensation bottle.
- Screw the adapter for cooling system testing device -V.A.G 1274/8- into the coolant expansion bottle.
- Clamp the connecting piece -V.A.G 1274 B/1- in the adapter for cooling system testing device -V.A.G 1274/8- .

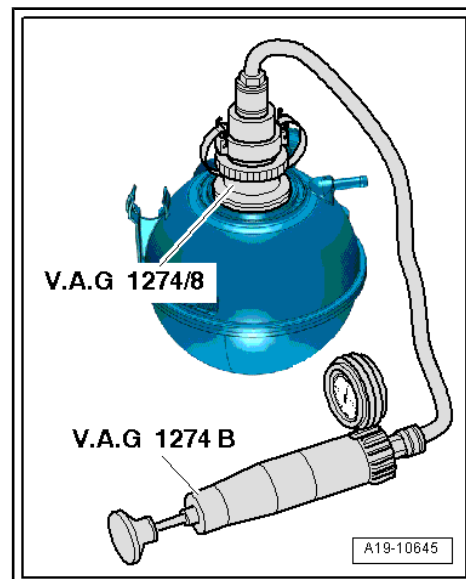
- Connect the connecting piece -V.A.G 1274 B/1- via the delivered connecting hose to the cooling system testing device - V.A.G 1274 B- .
- Using the hand pump of the testing device generate an over-pressure of approx. 0.1 MPa (1.0 bar).



WARNING

Risk of burning!

- ◆ *Before the cooling system testing device -V.A.G 1274 B- is separated from the connecting hose or the connecting piece -V.A.G 1274 B/1- , the existing pressure must absolutely be released.*
- ◆ *For this step, press the pressure relief valve on the cooling system testing device -V.A.G 1274 B- until the pressure gauge indicates the value "0".*



If the pressure drops:

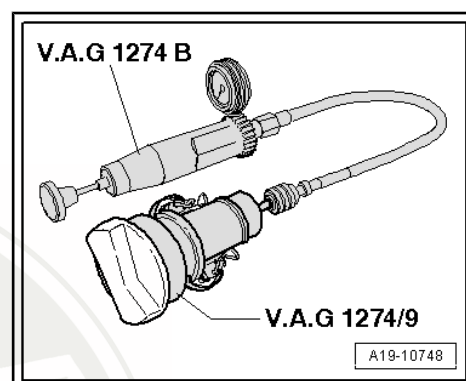
- Determine position of the leak and repair fault.

Testing the pressure relief valve in the cap

- Screw the screw cap into the adapter for cooling system testing device -V.A.G 1274/9- .
- Clamp the connecting piece -V.A.G 1274 B/1- in the adapter for cooling system testing device -V.A.G 1274/9- .
- Connect the connecting piece -V.A.G 1274 B/1- via the delivered connecting hose to the cooling system testing device - V.A.G 1274 B- .
- Operate the handpump.
- The pressure relief valve should open at a pressure of 0.14...0.16 MPa (1.4...1.6 bar).

If the pressure relief valve opens too early or too late:

- Replace cap.



20 – Fuel Supply

1 Fuel tank and fuel delivery unit



Note

- ♦ Fuel hoses at the engine must only be secured with spring-type clips ⇒ electronic catalogue of original parts.
- ♦ Use pliers for spring strap clamps to fit the spring strap clips.

1.1 Fuel tank - Summary of components

1 - Mounting part

2 - Screw cap

- ☐ replace if damaged

3 - Earth connection

- ☐ pay attention to locating element

4 - 11 Nm

5 - Guide

6 - 25 Nm

- ☐ replace

7 - Fuel tank

- ☐ removing and installing
⇒ [page 120](#)

8 - Circlip

9 - Bracket for the exhaust system

10 - Tensioning strap

- ☐ Check fitting position

11 - Cover plate

12 - Feed line

- ☐ to fuel rail
- ☐ check for firm seating

13 - Fuel filter

- ☐ Fitting position: arrow points in direction of flow

14 - Vent line

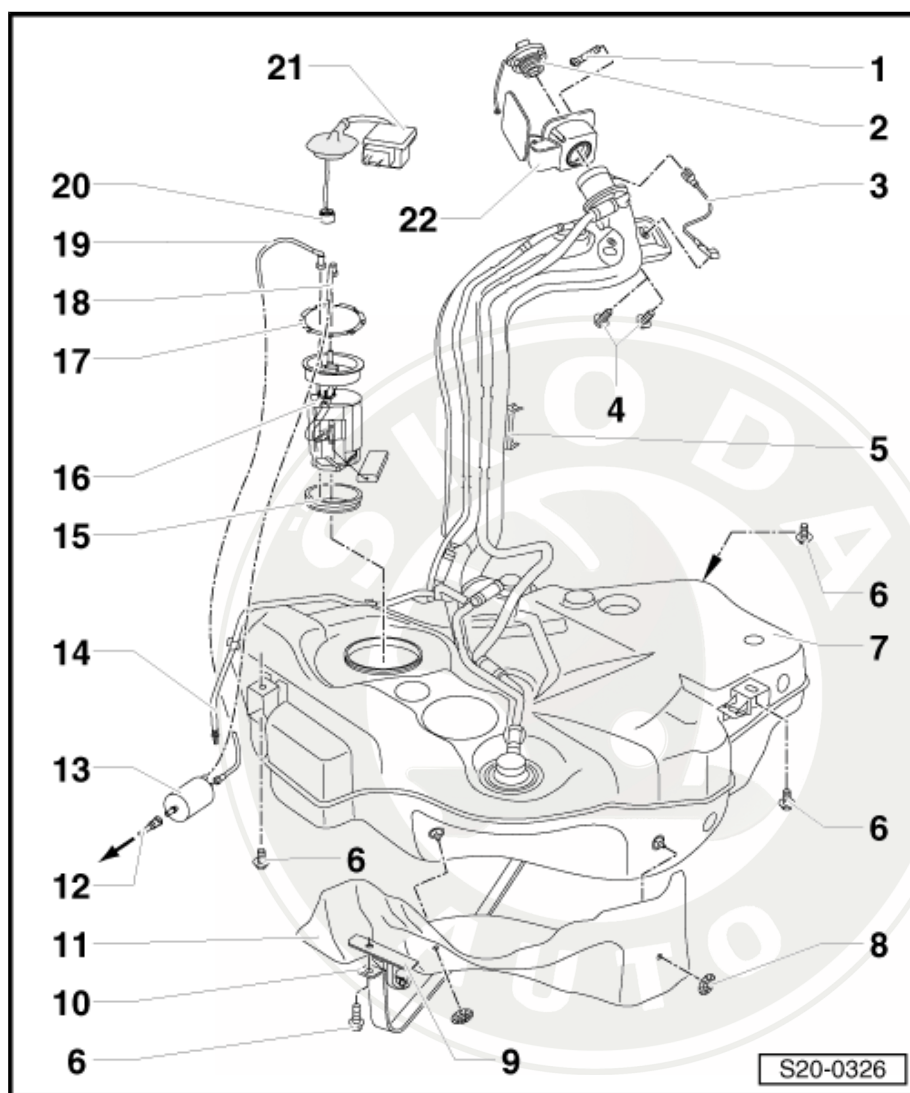
- ☐ clipped in place on the side of the fuel tank
- ☐ check for firm seating

15 - Sealing ring

- ☐ replace
- ☐ to be inserted dry into the opening of the fuel tank
- ☐ only moisten the inner seal of the flange with fuel for fitting purposes

16 - Fuel delivery unit

- ☐ removing and installing ⇒ [page 122](#)



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- ☐ Check fuel delivery unit ➔ [page 125](#)
- ☐ note the correct installed position in the fuel tank ➔ [page 117](#)
- ☐ with sender for fuel gauge display -G -
- ☐ Removing and installing the sender for fuel gauge display -G- ➔ [page 124](#)
- ☐ Clean strainer if dirty

17 - Lock ring, 110 Nm

- ☐ check for firm seating
- ☐ use wrench -T30101 (3087)- for removing and installing

18 - Feed line

- ☐ black
- ☐ clipped in place on the side of the fuel tank
- ☐ check for firm seating

19 - Return-flow line

- ☐ blue
- ☐ clipped in place on the side of the fuel tank
- ☐ check for firm seating

20 - Fuel pump control unit -J538 -

- ☐ after replacing, adapt the engine control unit -J623 - to the fuel pump control unit -J538- ➔ Vehicle diagnosis, testing and information system VAS 5051
- ☐ check ➔ Vehicle diagnosis, testing and information system VAS 5051

21 - Fuel tank lid unit

- ☐ with rubber bowl
- ☐ removing and installing ➔ Body Work ➔ Rep. Gr. 55

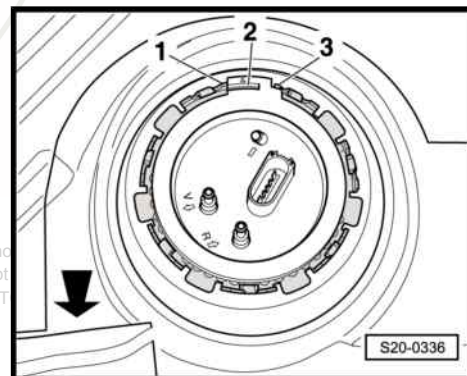
Fitting location of the fuel delivery unit

The peg -2- on the fuel delivery unit must be between the pegs -1- and -3-.



Note

- ◆ *-Arrow- points in direction of travel.*
- ◆ *The fuel delivery unit can only be installed in this position.*



1.2 Fuel filter - Summary of components

1 - Fuel filter

- ☐ with installed pressure limiting valve for fuel return-flow line

Opening pressure:
0.60...0.68 MPa (6.0...
6.8 bar)

- ☐ do not interchange connections
- ☐ Fitting position
⇒ [page 118](#)

2 - Fuel feed line

- ☐ black
- ☐ from fuel tank
- ☐ press in securing ring in order to unlock

3 - Fuel return-flow line

- ☐ blue
- ☐ to fuel tank
- ☐ press in securing ring in order to unlock

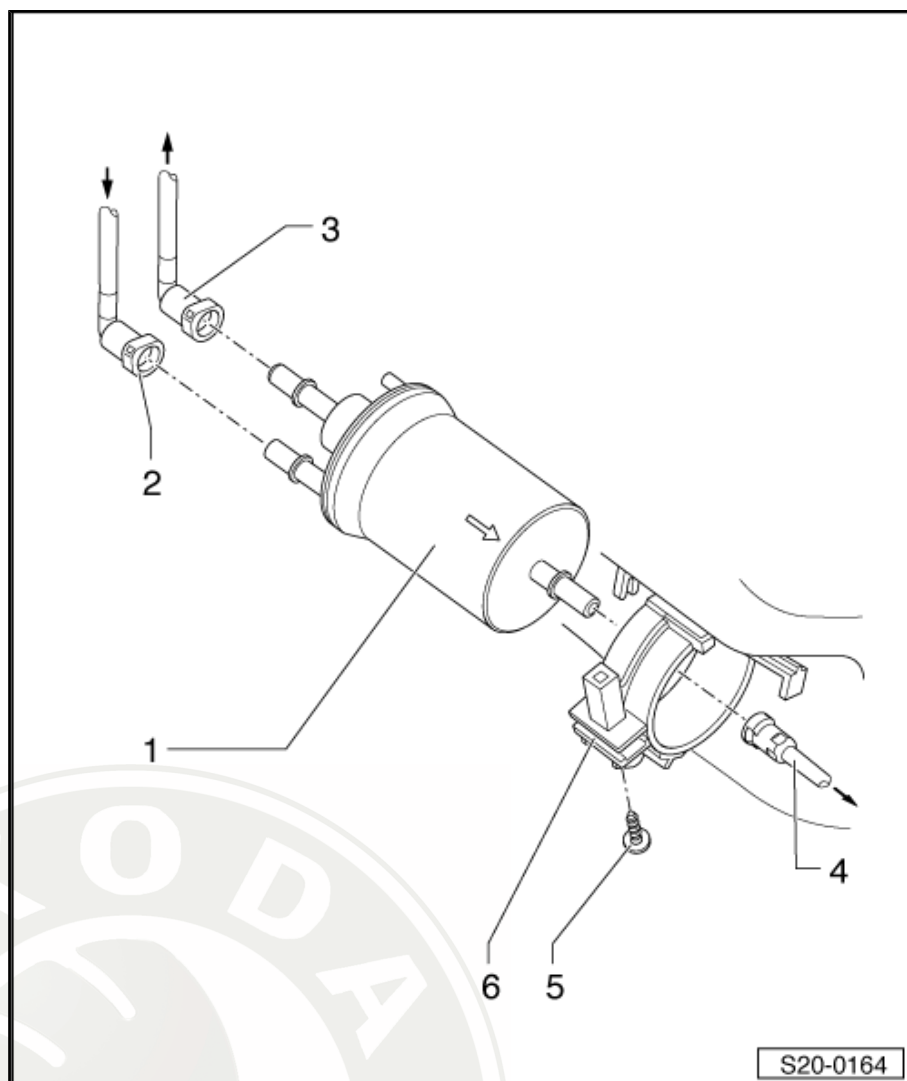
4 - Fuel feed line

- ☐ black
- ☐ to the engine
- ☐ press in securing ring in order to unlock

5 - 3 Nm

6 - Support

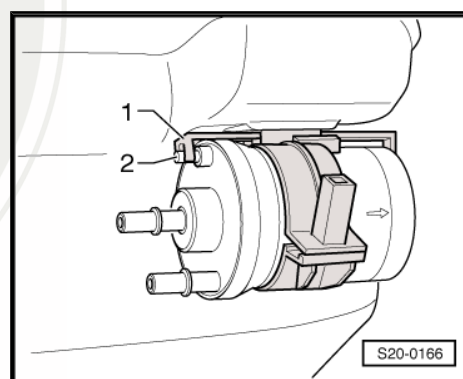
- ☐ for fuel filter
- ☐ attached to the fuel tank



Fitting position of the fuel filter

The pin -2- at the filter housing must engage in the recess -1- of the bracket.

The direction of flow is marked by arrows.



1.3 Extract fuel from the fuel tank

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Special tools and workshop equipment required

- ◆ Hose adapter , e.g. -V.A.G 1318 -16 -
- ◆ Adapter , e.g. -V.A.G 1318 -17-
- ◆ Measuring tool set , e.g. -V.A.G 1594 C-



- ◆ Battery
- ◆ Fuel tank

i Note

If the fuel pump is defective, suction off fuel using a fuel suction device, e.g. -VAS 5190-.

Work procedure

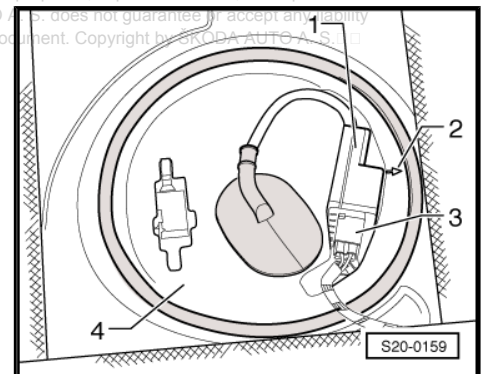
i Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ⇒ Body Work; Rep. Gr. 72.
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.

Vehicles with auxiliary heating.

- Unplug the 2-pin plug of the dosing pump -V54-.

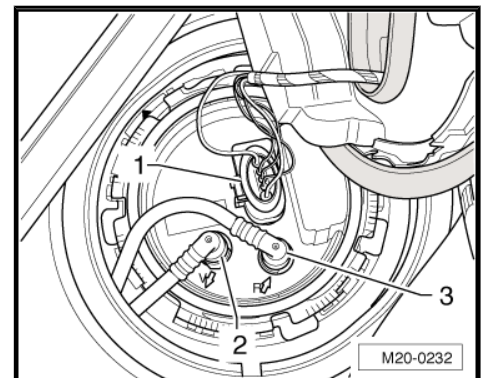
Continued for all vehicles



- Unplug the 5-pin connector -1- and the black feed line -2-.

i Note

Press in the securing ring in order to unlock the line.



- Connect the adapter -V.A.G 1318/16- and -V.A.G 1318/17- and fit this “drain pipe” onto the feed support of the fuel delivery unit.
- Hold the “drain pipe” in a suitable fuel tank.
- Connect the battery and the contacts of the fuel pump with adapter cables -A- from the adapter cable set -V.A.G 1594/C- as follows:

Battery positive (+) to contact -1- of the fuel pump

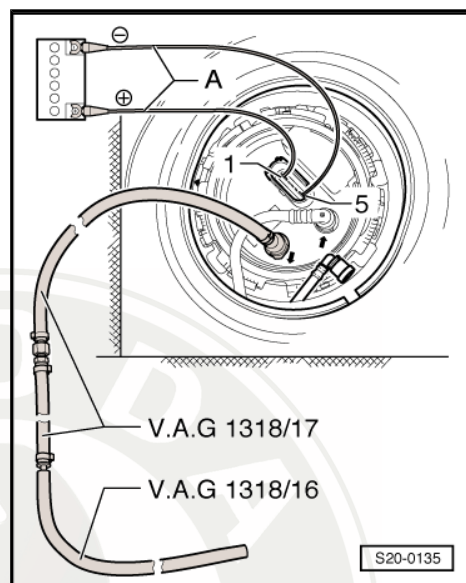
Battery minus (-) to contact -5- of the fuel pump

The fuel pump runs and suctions off fuel.



WARNING

In order to prevent an overflow of fuel in case of a too small fuel tank, the fuel pump must not run unattended.



1.4 Removing and installing the fuel tank

Special tools and workshop equipment required

- ♦ Engine/gearbox jack , e.g. -V.A.G 1383 A-
- The fuel tank must be empty for weight reasons when removing it, if necessary suction the fuel out of the fuel tank
⇒ [page 118](#) .

Removing



Note

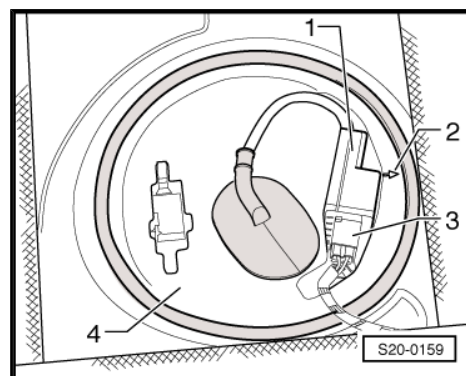
- ♦ *If necessary drain the fuel tank ⇒ [page 118](#) .*
- ♦ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#) .
- ♦ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#) .

- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ⇒ Body Work; Rep. Gr. 72 .
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.

Vehicles with auxiliary heating.

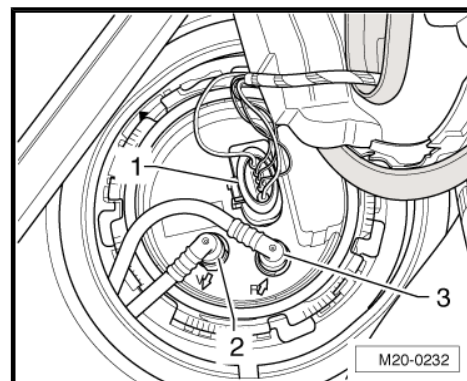
- Separate the 2 pin plug connection of the dosing pump -V54- .
- Remove the rubber grommet from the cover of the fuel delivery unit and pull out the wiring.

Continued for all vehicles

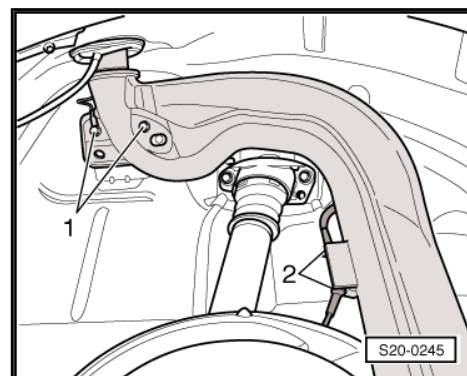




- Unplug the 5-pin plug -1- from the fuel pump.
- Open the fuel tank cap and clean around the fuel filler neck.
- Unscrew the cap from the fuel filler neck.
- Seal the filler neck with a clean foam piece in order to avoid any foreign bodies from entering.
- Unscrew right rear wheel.
- Remove the rear right wheelhouse liner ⇒ Body Work ⇒ Rep. Gr. 66 .



- Unscrew screws -1- for filler neck on the body.
- Unclip the electrical cable from the bracket -2- at the top and bottom of the filler neck.



- Disconnect vent line -1- (white) and fuel feed line -2- (black) at the connection point.



Note

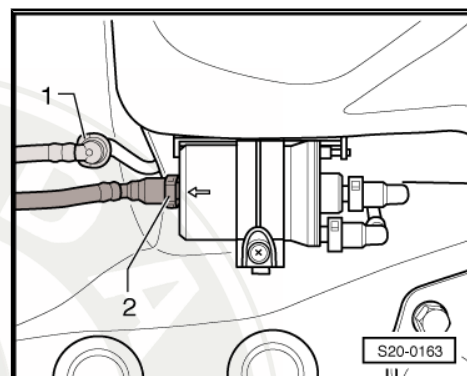
Press in the securing ring in order to unlock the line.

Vehicles with auxiliary heating.

- Separate the fuel line from the dosing pump -V54- .

Continued for all vehicles

- Remove middle part of exhaust system ⇒ [page 196](#)
If necessary, the middle and rear part of the exhaust system must be separated beforehand ⇒ [page 198](#) .

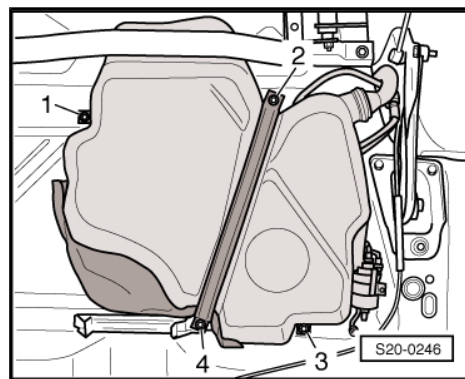


- Release fixing screws -2- and -4- and remove the tensioning strap.
- Support fuel tank using the engine/gearbox jack -V.A.G 1383 A-.
- Release fixing screws -1- and -3-.
- Slightly lower the fuel tank.



Note

The filler neck must be "extracted" between structure and rear axle. Lift down the fuel tank, with a 2nd mechanic, from engine/gearbox jack -V.A.G 1383 A-.

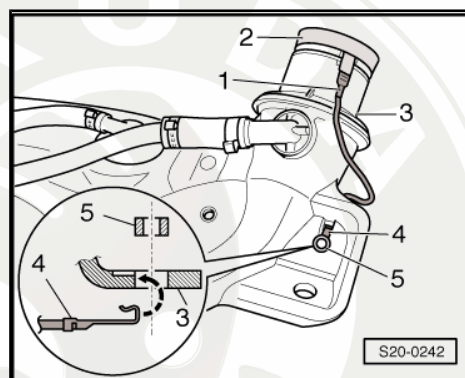


Install

- Check if the earth lead shows traces of oxidation on both connections, remove if necessary.
- Check fitting position of the earth lead -1-.
- The plug -1- on the metal plate ring -2- must be placed on firmly.
- The contact tab -4- must be hung in the fuel tank -3- and secured with the spacer bush -5-.
- Pull through the filler neck between the body and the rear axle with the help of a second mechanic. Then position the fuel tank onto the engine/gearbox jack -V.A.G 1383 A-.

Further installation occurs in reverse order. Pay attention to the following:

- ♦ Lay the vent and fuel lines without any kinks.
- ♦ Do not mix-up the feed line and the return-flow line (the return-flow line is blue, the feed line is black).
- ♦ Make sure the line connections fit tightly.
- ♦ Check earth connection of fuel tank/body at filler neck.
- ♦ After installing the fuel tank, check whether the lines are still clipped in place on the fuel tank.



1.5 Removing and installing fuel delivery unit

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Special tools and workshop equipment required

- ♦ Key -T30101 (3087)-

Removing

- The fuel tank must not be more than $\frac{3}{4}$ full.



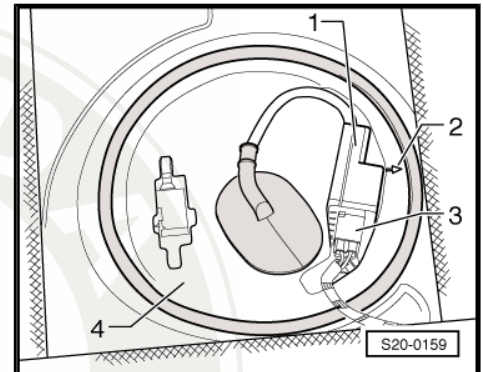
Note

- ♦ *If necessary, extract fuel from the fuel tank ⇒ [page 118](#).*
- ♦ *Safety precautions when working on the fuel supply system ⇒ [page 3](#).*
- ♦ *Rules of cleanliness when working on the fuel supply system ⇒ [page 5](#).*

- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ⇒ Body Work; Rep. Gr. 72 .
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.

i Note

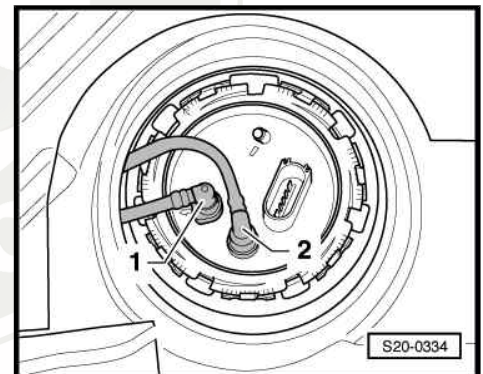
For vehicles with auxiliary heating, the plug connection for the dosing pump -V54- must be disconnected additionally.



- Disconnect the 5-pin plug, detach the black feed line -1- and the blue return-flow line -2-.

i Note

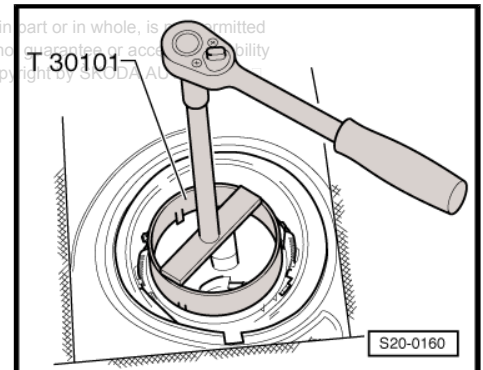
- ◆ Press in securing ring in order to unlock the lines.
- ◆ For vehicles with auxiliary heating the suction line for the dosing pump -V54- must be pulled out additionally (open lower clamp).



- Open lock ring with the wrench -T30101-.

i Note

- ◆ Take the fuel delivery unit out of the fuel tank in such a way that the electrical cables and the fuel hoses are not damaged and that the float arm of the sender for the fuel gauge display -G- is not bent.
- ◆ You must empty the old delivery unit before disposing of it if you wish to replace the fuel delivery unit.



- Pull the fuel delivery unit out of the opening of the fuel tank.

Install

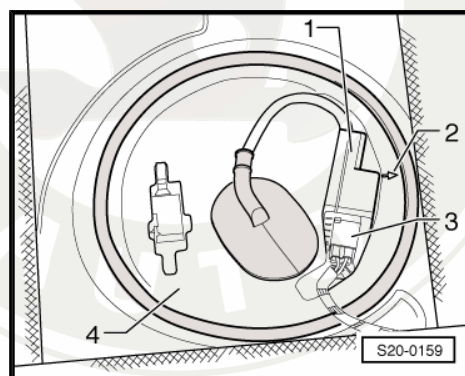
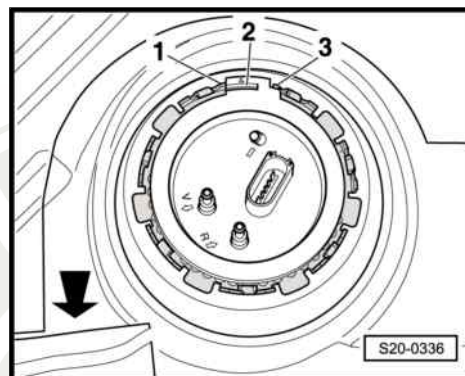
Installation occurs in reverse order. Pay attention to the following:

- Insert the new dry gasket ring of the flange into the opening of the fuel tank and moisten only from the inside with fuel for installing the closing flange.
- Insert the fuel delivery unit into the fuel tank in such a way that the float arm of the sender for the fuel gauge display -G- is not bent.
- Press the closing flange downwards, install the lock ring and connect the fuel lines.



Note

- ◆ Pay attention to installed position of flange of fuel delivery unit:
The peg -2- on the fuel delivery unit must be between the pegs -1- and -3-. The -arrow- shows the direction of travel.
 - ◆ Tighten the lock ring to 110 Nm.
 - ◆ Do not interchange the black feed line with the blue return-flow line (arrows on the flange of the fuel delivery unit).
 - ◆ Make sure the line connections and the 5-pin plug fit tightly.
 - ◆ After installing the fuel delivery unit, check whether the feed and return-flow lines are also clipped on the fuel tank.
- Clip on cover -4- with fuel pump control unit -J538- -1-.
 - The arrow -2- on the cover points in direction of travel.

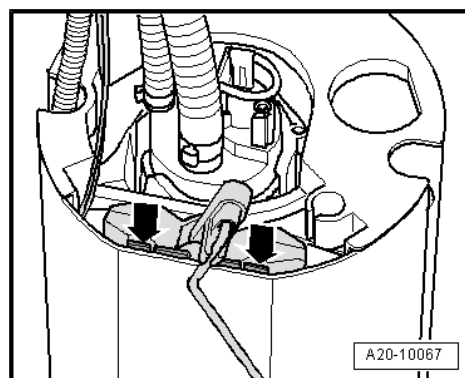


1.6 Removing and installing the sender for fuel gauge display -G-

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Removing

- Remove fuel delivery unit ➔ [page 122](#) .
- Unlock the securing tabs -arrows- using a screwdriver and pull out the sender for fuel gauge display -G- towards the top.

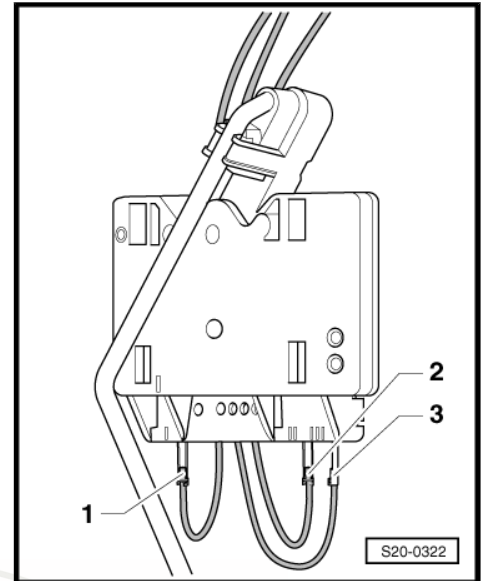




- Unlatch and disconnect the plug connection of the lines -1- (brown), -2- (blue) and -3- (black).

Install

- Connect the lines and check the connector for secure catch.
- Insert the sender for fuel gauge display -G- in the guide at the fuel delivery unit and press downwards until it latches into position.
- Install fuel delivery unit ➔ [page 122](#) .



1.7 Testing fuel pump

Special tools and workshop equipment required

- ◆ Key -T30101 (3087)-
- ◆ Pressure gauge , e.g. -V.A.G 1318- or pressure gauge , e.g. -VAS 6550-
- ◆ Adapter , e.g. -V.A.G 1318/11-
- ◆ Hose adapter , e.g. -V.A.G 1318/16-
- ◆ Adapter set , e.g. - V.A.G 1318/17A-
- ◆ Double connection piece , e.g. - V.A.G 1318/23-
- ◆ Remote control , e.g. -V.A.G 1348/3A- with adapter cable , e.g. -V.A.G 1348/3-3 -
- ◆ Voltage tester , e. g. -V.A.G 1527 B-
- ◆ Measuring tool set , e.g. -V.A.G 1594 C-
- ◆ Multimeter , e.g. -V.A.G 1715-
- ◆ Adapter for measuring method/DSO (5-pin) , e.g. -VAS 5565-
- ◆ Vehicle Diagnosis, Measurement and Information System - VAS 505X-
- ◆ Measuring vessel



Note

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- ◆ *The adapter set -V.A.G 1318/17A- replaces the adapter set -V.A.G 1318/17- .*
- ◆ *The figures shown in the description were not changed for this reason.*



Inspect proper operation and power supply ⇒ [page 126](#)

Check fuel pressure with pressure gauge -V.A.G 1318-
⇒ [page 128](#)

Check fuel pressure with pressure gauge -VAS 6550-
⇒ [page 129](#)

Check holding pressure with pressure gauge -V.A.G 1318 -
⇒ [page 131](#)

Check holding pressure with pressure gauge -VAS 6550-
⇒ [page 132](#)

Checking fuel flow rate with pressure gauge -V.A.G 1318 -
⇒ [page 134](#)

Checking fuel flow rate with pressure gauge -VAS 6550-
⇒ [page 136](#)

Check power consumption ⇒ [page 139](#)

1.7.1 Inspecting proper operation and power supply

Test conditions

- Battery voltage at least 11.5 V.
- Fuel pump fuse O.K. ⇒ Current flow diagrams and Fitting locations.
- Fuel pump control unit -J538- O.K.

Test sequence



Note

The function of the fuel pump is tested with the actuator diagnosis.

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- Connect vehicle diagnosis, measurement and information system -VAS 505X- .
- Switch on ignition.
- On the display press consecutively the buttons for “Vehicle self-diagnosis”, “01 - Engine electronics” and “03 - Actuator diagnosis”.
- On the display press the right arrow button up to the actuator diagnosis of the fuel pump electronics.
- The fuel pump must now run slowly to the maximum speed.



Note

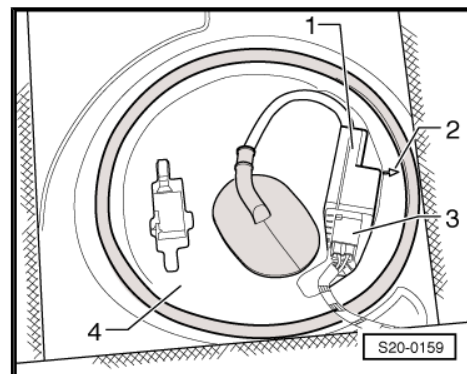
The fuel pump runs very quietly.

- Switch off ignition.

The fuel pump does not run:

- Removing rear seat bench ⇒ Body Work; Rep. Gr. 72 .

- Disconnect plug -3- from fuel pump control unit -J538- .



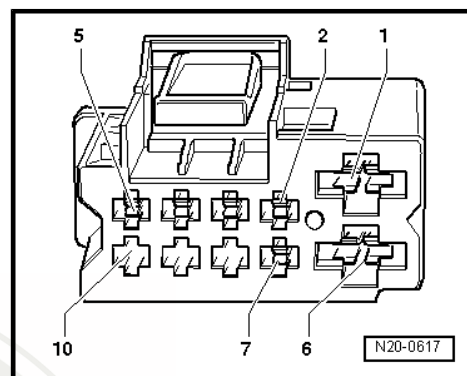
- Testing the voltage supply with the voltage tester -V.A.G 1527B- between contact -1- and -6-.

- The LED must light up.

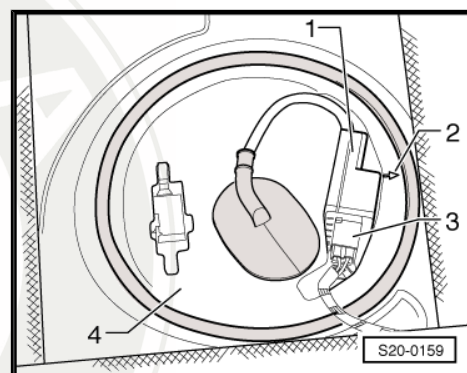
LED does not light up:

- Determine and remove open circuit in the wiring according to the current flow diagram ⇒ Current flow diagrams and Fitting locations.

The LED lights up (power supply O.K.):



- Unclip the cover -4- with the fuel pump control unit -J538- -1-.



- First of all check the plug -1- for correct fit. To do so, pull on the plug without pressing the catch.

If the plug was not correctly plugged in:

- Repeat the functional test of the fuel pump.

If the plug was correctly plugged in:

- Now unplug the plug -1-.

- Check the contacts at the plug and at the fuel delivery unit for damage.

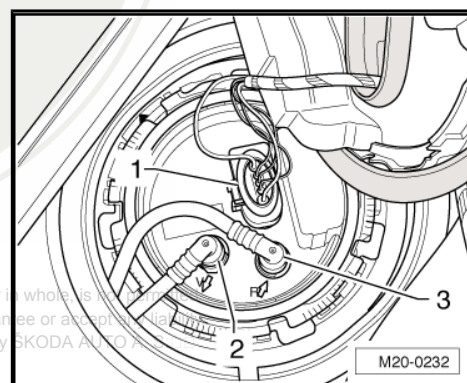
If no damage was detected:

- Remove fuel delivery unit ⇒ [page 122](#) .

- Check whether the electric wiring between the flange and the fuel delivery unit is connected.

If there is no open circuit in the wiring:

- Fuel pump defective, replace fuel delivery unit ⇒ [page 122](#) .



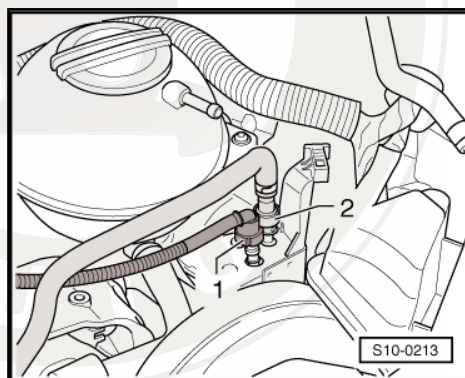
1.7.2 Check fuel pressure with pressure gauge -V.A.G 1318-

- The function of the fuel pump was checked ⇒ [page 126](#) .



Note

- ♦ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#) .
- ♦ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#) .
- Disconnect the feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.



- Install the pressure gauge -V.A.G 1318 - with the adapter set -V.A.G 1318/17A- instead of the fuel feed line.
- Open shut-off cock of the pressure gauge. The lever then points in position -A-.
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4 ... 0.7 MPa (4 ... 7 bar)

If fuel line is o.k.:

- Test holding pressure ⇒ [page 131](#) .

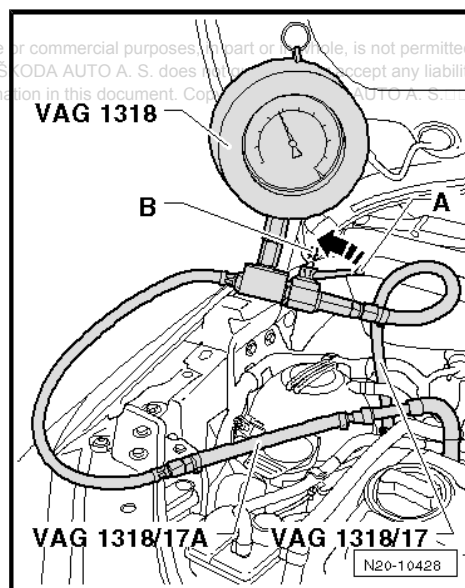
If the specified pressure is exceeded:

- Check the return line between the fuel filter and fuel pump for kinks and blockages.

If no fault is found:

- Pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the measurement is less than the specification:



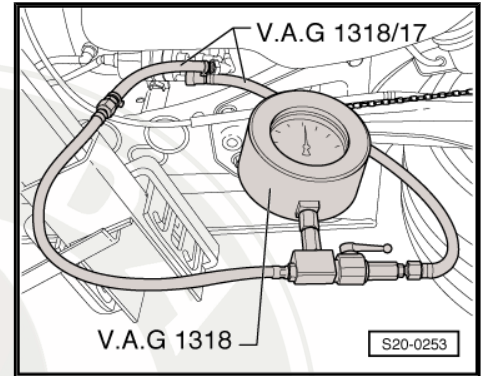


- Check the fuel pressure before the fuel filter. For this step connect the pressure gauge -V.A.G 1318- with the adapter set -V.A.G 1318/17A- between the fuel filter and the fuel feed line.
- Open shut-off cock of the pressure gauge. Lever points in direction of flow.
- Start engine and run in idle.



Caution

The shut-off cock must only be closed slowly. At a fuel pressure of 0.8 MPa (8 bar), the shut-off cock must be immediately opened, in order to avoid a damage of the pressure gauge.



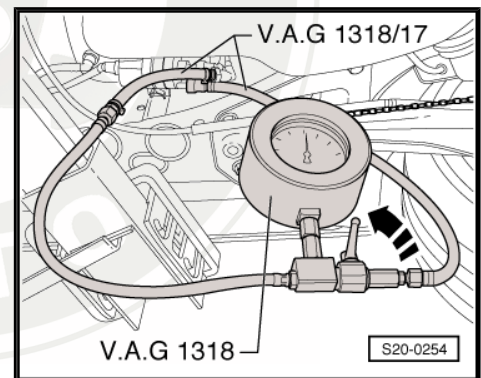
- Slowly close the shutoff cock of the pressure measuring device. The pressure must rise to at least 0.7 MPa (7.0 bar). If the 0.7 MPa (7.0 bar) is reached, immediately open the shut-off cock again!

If the pressure has risen:

- Fuel pump O.K., pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the pressure does not rise:

- Fuel pump defective, replace fuel delivery unit ⇒ [page 122](#) .



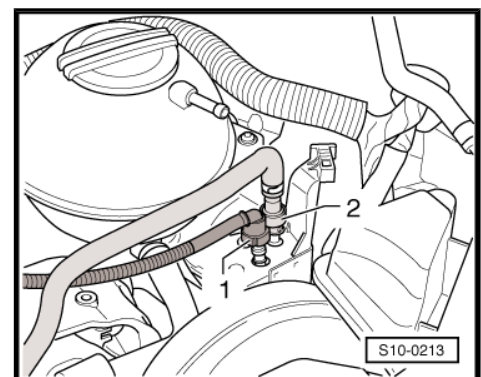
1.7.3 Check fuel pressure with pressure gauge -VAS 6550-

- The function of the fuel pump was checked ⇒ [page 126](#) .



Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#) .
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#) .
- Remove the fuel feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.



- Connect the pressure gauge -VAS 6550- with adapter -VAS 6550/1- and -VAS 6550/2- to the fuel feed line.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4 ... 0.7 MPa (4 ... 7 bar)

If fuel line is o.k.:

- Test holding pressure ➔ [page 131](#) .

If the specified pressure is exceeded:

- Check the return line between the fuel filter and fuel pump for kinks and blockages.

If no fault is found:

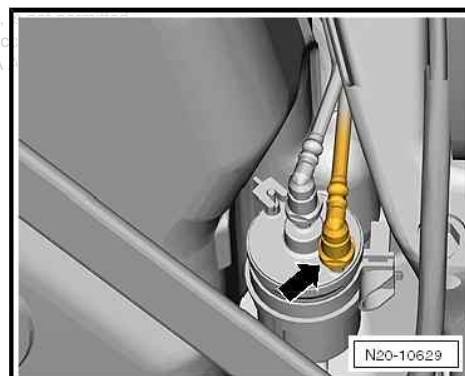
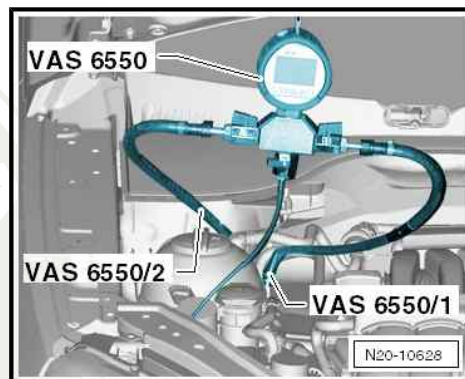
- Pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the measurement is less than the specification:

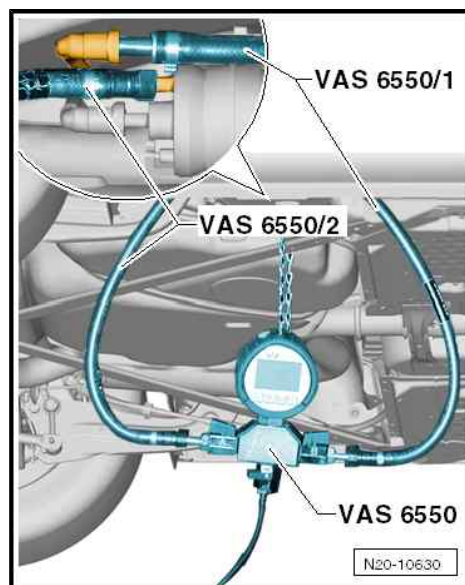
- Check the fuel pressure before the fuel filter, to do so proceed as follows:

- Disconnect fuel feed line -arrow- at fuel filter.

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- Connect the pressure gauge -VAS 6550- with adapter -VAS 6550/1- and -VAS 6550/2- between the fuel filter and the fuel feed line.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Start engine and run in idle.



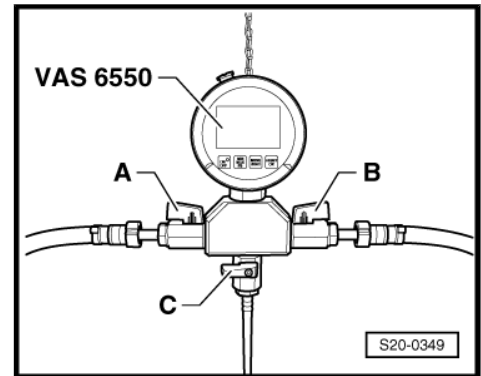
- Slowly close the shutoff cock -A-.
- The pressure must rise to at least 0.7 MPa (7.0 bar).
- If the 0.7 MPa (7.0 bar) is reached, immediately open the shut-off cock again!

If the pressure has risen:

- Fuel pump O.K., pressure limiting valve in the fuel filter defective, replace the fuel filter.

If the pressure does not rise:

- Fuel pump defective, replace fuel delivery unit ➔ [page 122](#) .



1.7.4 Checking holding pressure with pressure gauge -V.A.G 1318-

- Fuel pressure O.K. and pressure gauge -V.A.G 1318- connected in the engine compartment ➔ [page 128](#) .



Note

- ◆ *Safety precautions when working on the fuel supply system* ➔ [page 3](#) .
- ◆ *Rules of cleanliness when working on the fuel supply system* ➔ [page 5](#) .
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4 ... 0.7 MPa (4 ... 7 bar)
- Observe pressure drop at pressure gauge.
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure still drops:

- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Immediately close the shutoff cock of the pressure measuring device. The lever then points in the position -B-.

If the pressure again drops:

- Check the low-pressure line to the high pressure pump for **tightness**.
- SKODA AUTO A. S. ŠKODA AUTO A. S. does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by ŠKODA AUTO A. S.

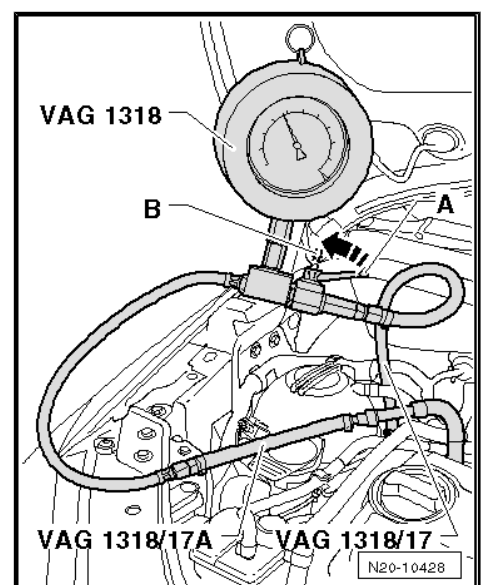
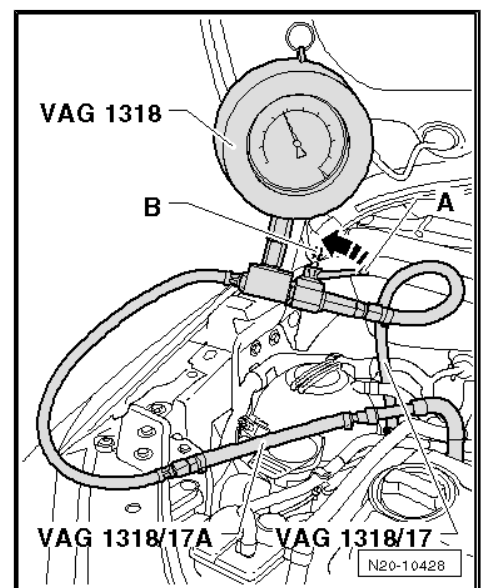
If no fault is found:

- Replace high pressure pump ➔ [page 179](#) .

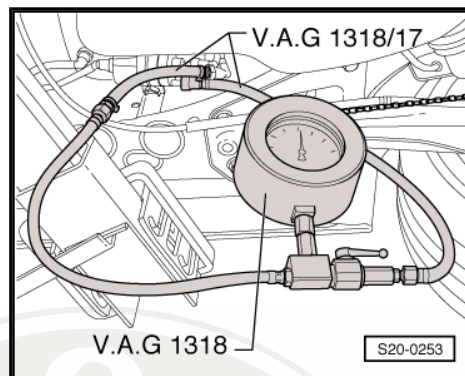
Now the pressure does no longer drop:

- Check the fuel line to the fuel filter for tightness.

If the fuel line is not found to be faulty:



- Check the non-return valve in the fuel delivery unit. For this step connect the pressure measuring device -V.A.G 1318- with the adapter -V.A.G 1318/17A- between the fuel filter and the fuel feed line.
- Open shut-off cock of the pressure gauge. Lever points in direction of flow.
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4 ... 0.7 MPa (4 ... 7 bar)



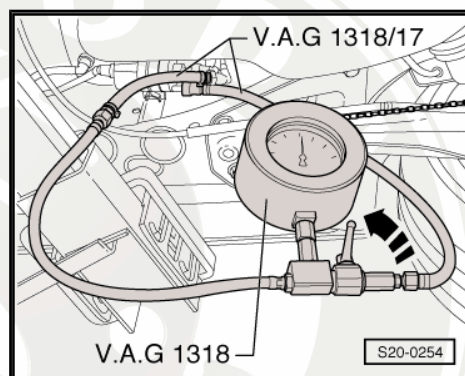
- Immediately close the shut-off cock of the pressure gauge after the pressure has built up.
- Observe pressure drop at pressure gauge.
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure drops:

- Non-return valve in the fuel pump faulty, replace fuel delivery unit ➔ [page 122](#).

If the pressure does not drop:

- Pressure limiting valve in the fuel filter defective, replace the fuel filter.



1.7.5 Checking holding pressure with pressure gauge -VAS 6550-

- Fuel pressure O.K. and pressure gauge -VAS 6550- connected in the engine compartment ➔ [page 129](#).



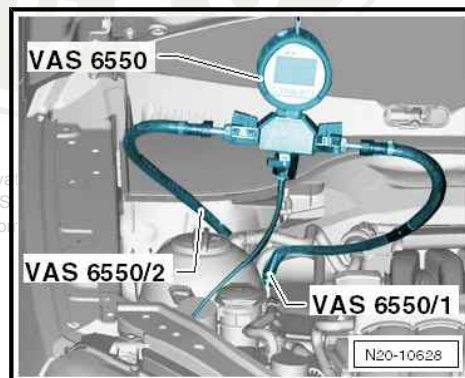
Note

- ♦ *Safety precautions when working on the fuel supply system* ➔ [page 3](#).
- ♦ *Rules of cleanliness when working on the fuel supply system* ➔ [page 5](#).

- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4 ... 0.7 MPa (4 ... 7 bar)
- Observe pressure drop at pressure gauge.
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure still drops:

- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.



- Immediately close the shut-off cock -B- of the pressure gauge after the pressure has built up. The lever points at right angles in the direction of flow.

Now the pressure does no longer drop:

Note

Search for leakage on the engine side. Repeat the holding pressure test. This time, close the shut-off cock -A- in order to determine if a leak is indeed present on the engine side.

- Check the low-pressure line to the high pressure pump for tightness.

If no fault is found:

- Replace high pressure pump ⇒ [page 179](#) .

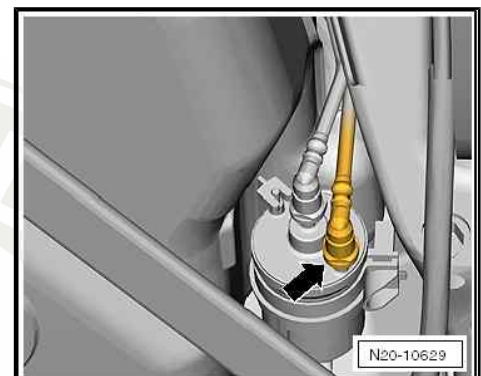
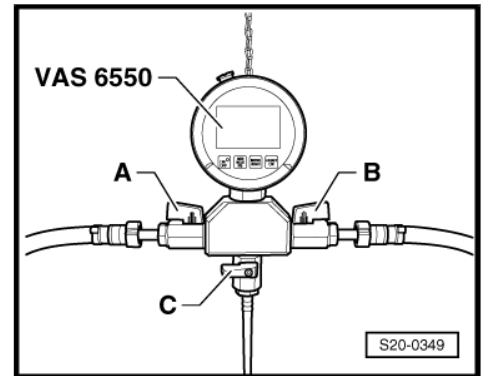
If the pressure again drops:

Search for leakage on the fuel tank side, to do so proceed in the following manner:

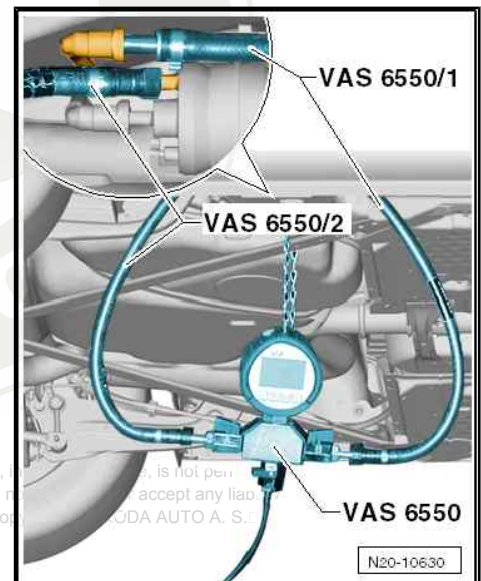
- Check the fuel line to the fuel filter for tightness.

If the fuel line is not found to be faulty:

- Check the pressure holding valve in the fuel delivery unit. To do so proceed in the following manner:
- Disconnect fuel feed line -arrow- at fuel filter.



- Connect the pressure gauge -VAS 6550- with adapter -VAS 6550/1- and -VAS 6550/2- between the fuel filter and the fuel feed line.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Switch the ignition on and off so often until the fuel pressure on the pressure gauge does no longer rise.
- Read off fuel pressure on the pressure gauge.
- Specified value: 0.4 ... 0.7 MPa (4 ... 7 bar)



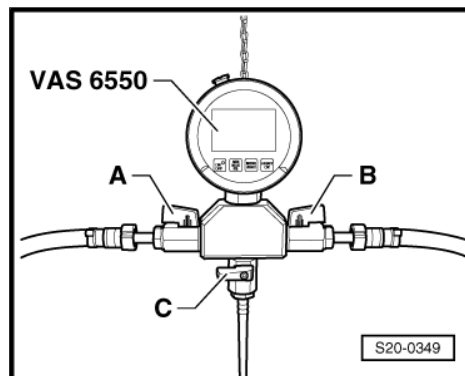
- After the pressure has built up, close the shut-off cock -A-.
- Observe pressure drop at pressure gauge.
- The pressure must not drop below 0.3 MPa (3.0 bar) after 10 minutes.

If the pressure drops:

- Non-return valve in the fuel pump faulty, replace fuel delivery unit ➔ [page 122](#).

If the pressure does not drop:

- Pressure limiting valve in the fuel filter defective, replace the fuel filter.

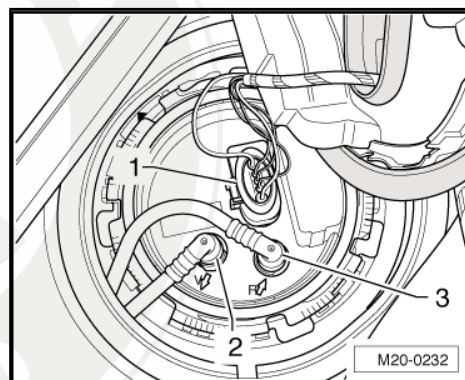
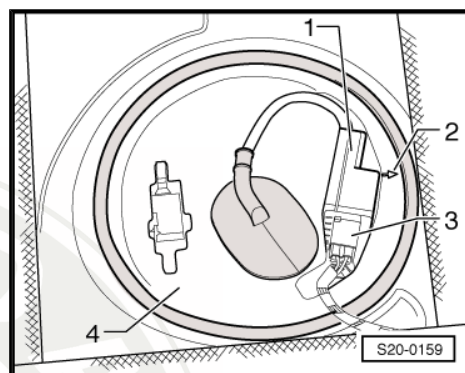


1.7.6 Checking fuel flow rate with pressure gauge -V.A.G 1318-



Note

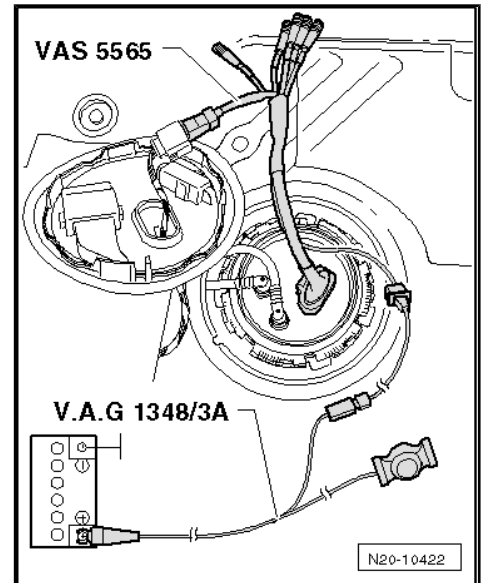
- ♦ *Safety precautions when working on the fuel supply system*
➔ [page 3](#).
- ♦ *Rules of cleanliness when working on the fuel supply system*
➔ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.
- Removing rear seat bench ➔ Body Work; Rep. Gr. 72.
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.
- First of all check the plug -1- for correct fit. To do so, pull on the plug without pressing the catch. If the plug connection was not correctly positioned, this could cause a fault.
- Now unplug the plug -1-.
- Check the contacts at the plug and at the fuel delivery unit for damage.



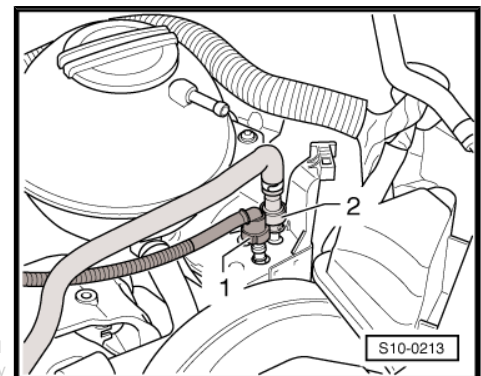
- Connect the adapter for measuring method/DSO (5-pin) -VAS 5565- to the plug connection and to the fuel delivery unit.
- Connect remote control -V.A.G 1348/3A- to adapter -VAS 5565- and to battery positive (+).

Note

This step is only intended to ensure that the fuel delivery unit runs when the engine is switched off.



- Disconnect the feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.



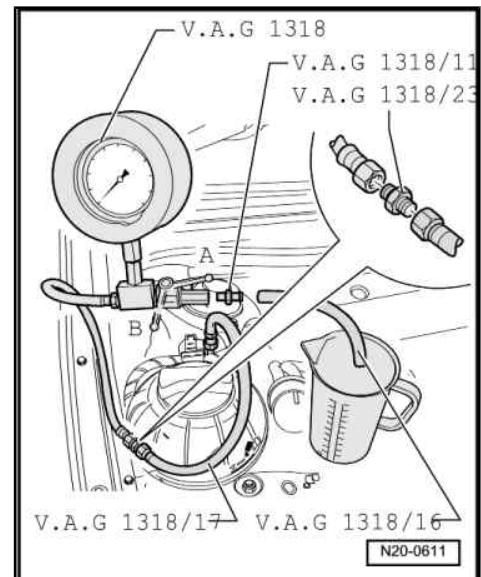
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- Connect the pressure gauge -V.A.G 1318- with the double connection piece -V.A.G 1318/23 - and the adapter -V.A.G 1318/17A- to the fuel feed line.
- Fit hose adapter -V.A.G 1318/16 - onto the adapter -V.A.G 1318/11- of the pressure measuring device and hold in a measuring vessel.
- Close the shutoff cock of the pressure measuring device. The lever then points in the position -B-.



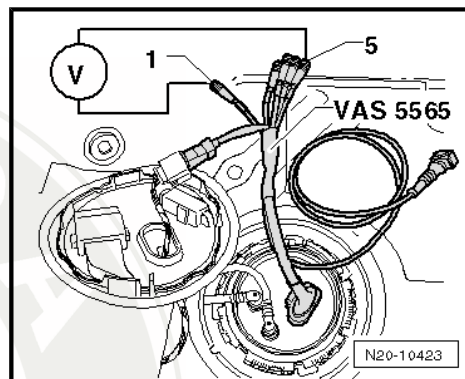
WARNING

Danger of liquid spraying out when opening the shut-off valve. Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Hold the container in front of the free connection to the pressure gauge.



- Open shut-off cock of the pressure gauge. The lever then points in the direction of flow -A-.
- Activate remote control -V.A.G 1348/3A - . While doing so, slowly close the shut-off cock until the pressure gauge displays 0.4 MPa (4 bar) overpressure. Now do not make any further changes to the position of the shut-off cock.
- Empty measuring glass.

- The fuel flow rate of the fuel delivery unit is dependent on the battery voltage. For this reason, additionally connect the multimeter -V.A.G 1715- to the outgoing circuits -1 and 5- of the adapter for measuring method/DSO (5-pin) -VAS 5565-.
- Activate remote control for 30 seconds while measuring the battery voltage.



- Compare the fuel rate with the specified value.

*) minimum flow rate 1 cm³/30 s

**) Voltage at the fuel pump when engine not running and delivery unit operating.

Read out examples:

During the test a voltage of 10.5 V was measured. Thus a minimum flow rate of 580 cm³/30 s is obtained.

If the minimum flow rate is not reached:

- Check the fuel lines for possible restrictions (kinks) or blocking.

If no fault is found:

- Take cap off fuel filler neck and repeat the test.

If the fuel flow rate is now reached:

- Check the ventilation of the fuel tank.

If the minimum flow rate is again not reached:

- Disconnect the feed hose -1- from the fuel filter inlet.
- Connect pressure gauge -V.A.G 1318- with the adapter set -V.A.G 1318/17A- to the hose.
- Repeat fuel flow rate test.

If the minimum flow rate is now reached:

- Replace fuel filter.

If the minimum flow rate is again not reached:

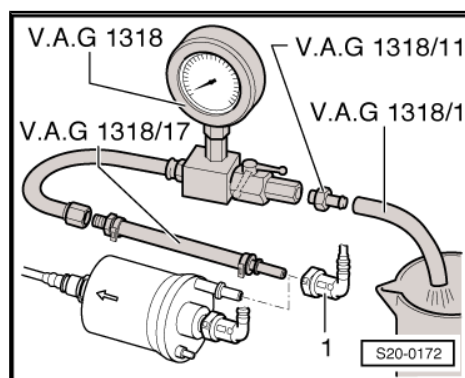
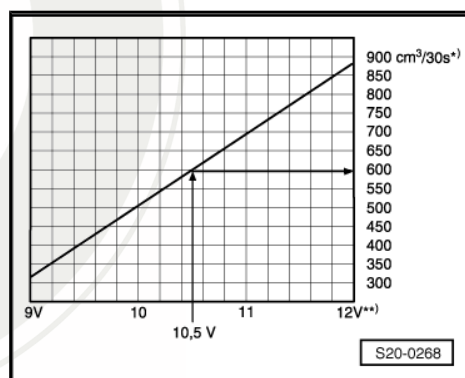
- Remove fuel delivery unit and inspect filter strainer for soiling.

If you have still not found any fault up to this stage:

- Replace fuel delivery unit ➔ [page 122](#).

If the required fuel flow rate has been achieved, but a fault is still suspected in the fuel supply system (e.g. intermittent breakdown of the fuel supply):

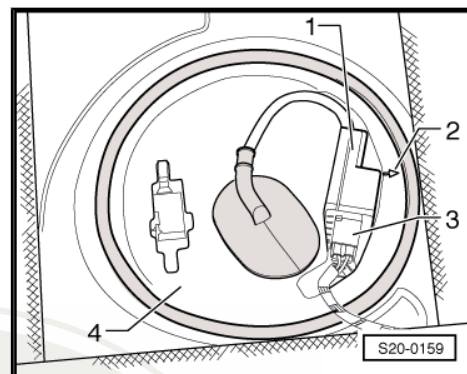
- Check power consumption of the fuel delivery unit ➔ [page 139](#).



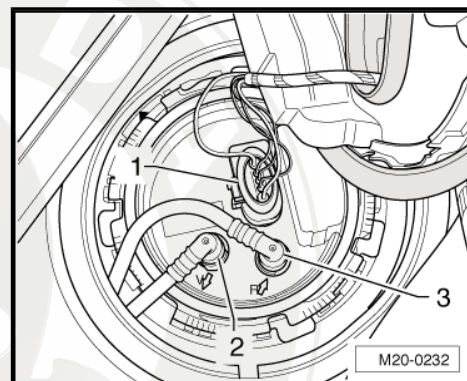
1.7.7 Checking fuel flow rate with pressure gauge -VAS 6550-

- Switch off the ignition and all electrical components and take out the ignition key.

- Removing rear seat bench ⇒ Body Work; Rep. Gr. 72 .
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.



- First of all check the plug -1- for correct fit. To do so, pull on the plug without pressing the catch. If the plug connection was not correctly positioned, this could cause a fault.
- Now unplug the plug -1-.
- Check the contacts at the plug and at the fuel delivery unit for damage.



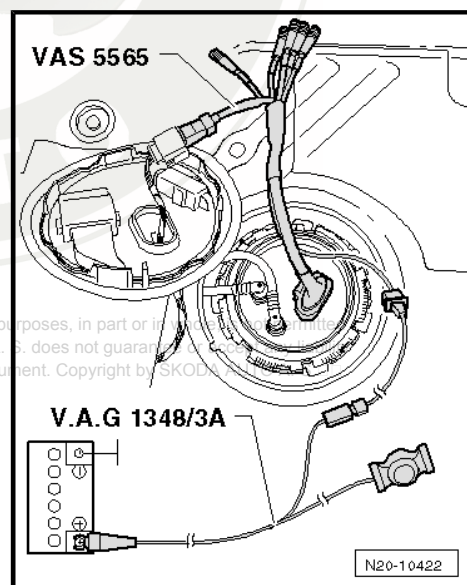
- Connect the adapter for measuring method/DSO (5-pin) -VAS 5565- to the plug connection and to the fuel delivery unit.
- Connect remote control -V.A.G 1348/3A- to adapter -VAS 5565- and to battery positive (+).



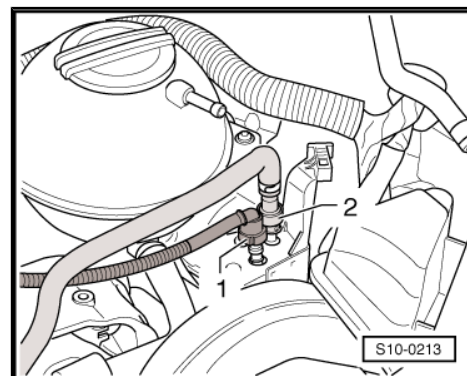
Note

This step is only intended to ensure that the fuel delivery unit runs when the engine is switched off.

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- Disconnect the feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.

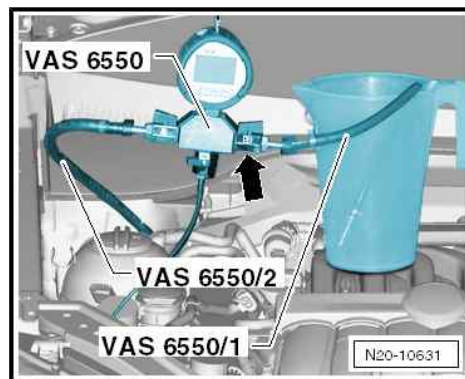


- Connect the pressure gauge -VAS 6550- with the adapter -VAS 6550/2- to the fuel feed line. Hold the adapter -VAS 6550/1- in a measuring vessel.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.

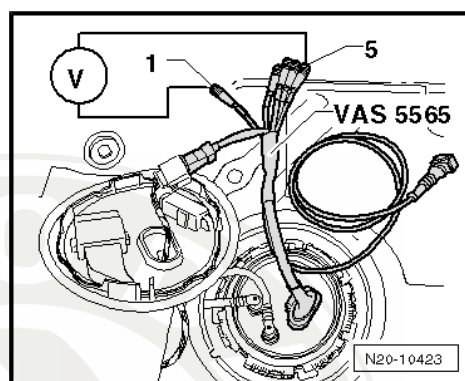


WARNING

Danger of liquid spraying out when opening the shut-off valve. Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel. Hold the container in front of the free connection to the pressure gauge.



- Activate remote control -V.A.G 1348/3A - . While doing this, slowly close the shut-off cock -arrow- until the pressure gauge displays 0.4 MPa (4 bar) overpressure. Now do not make any further changes to the position of the shut-off cock.
- Empty measuring glass.
- The fuel flow rate of the fuel delivery unit is dependent on the battery voltage. For this reason, additionally connect the multimeter -V.A.G 1715- to the outgoing circuits -1 and 5- of the adapter for measuring method/DSO (5-pin) -VAS 5565- .
- Activate remote control for 30 seconds while measuring the battery voltage.



- Compare the fuel rate with the specified value.

*) minimum flow rate 1 cm³/30 s

**) Voltage at the fuel pump when engine not running and delivery unit operating.

Read out examples:

During the test a voltage of 10.5 V was measured. Thus a minimum flow rate of 580 cm³/30 s is obtained.

If the minimum flow rate is not reached:

- Check the fuel lines for possible restrictions (kinks) or blocking.

If no fault is found:

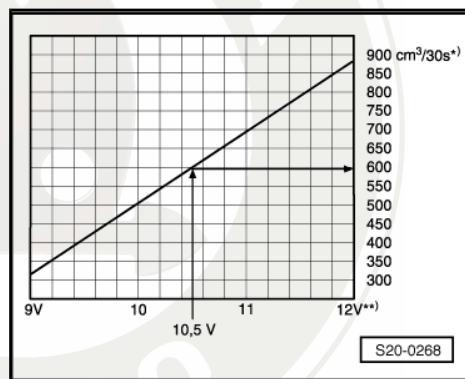
- Take cap off fuel filler neck and repeat the test.

If the fuel flow rate is now reached:

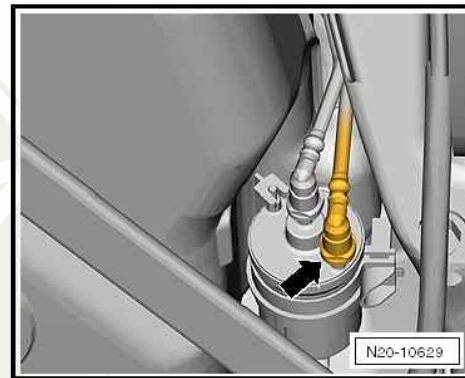
- Check the ventilation of the fuel tank.

If the minimum flow rate is again not reached:

- Check the fuel filter, to do so proceed as follows:



- Disconnect fuel feed line -arrow- at fuel filter.



- Connect the pressure gauge -VAS 6550- with the adapter -VAS 6550/1- to the fuel feed line. Hold the adapter -VAS 6550/2- in a measuring vessel.
- Make sure that the discharge cock is closed and the shut-off cocks are opened.
- Repeat fuel flow rate test.

If the minimum flow rate is now reached:

- Replace fuel filter.

If the minimum flow rate is again not reached:

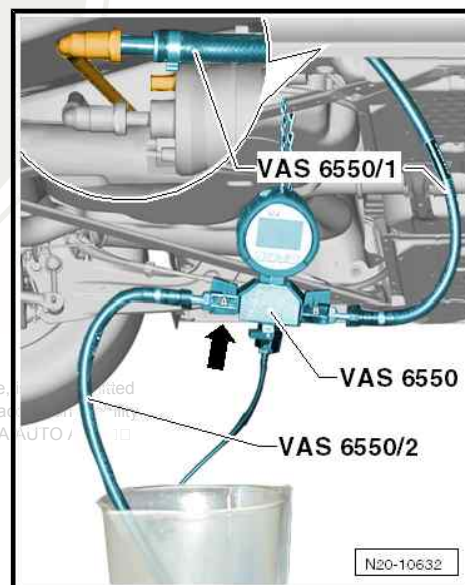
- Remove fuel delivery unit and inspect filter strainer for soiling.

If you have still not found any fault up to this stage:

- Replace fuel delivery unit ⇒ [page 122](#).

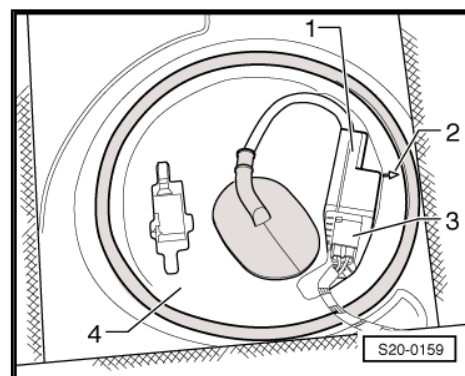
If the required fuel flow rate has been achieved, but a fault is still suspected in the fuel supply system (e.g. intermittent breakdown of the fuel supply):

- Check power consumption of the fuel delivery unit
⇒ [page 139](#).



1.7.8 Check power consumption

- Fold up rear seat.
- Unclip the cover -4- with the fuel pump control unit -J538- -1-.

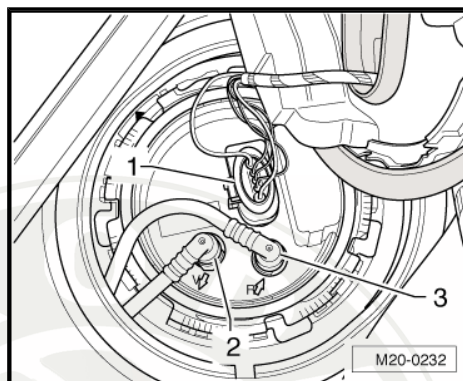




- First of all check the plug -1- for correct fit. To do so, pull on the plug without pressing the catch. If the plug connection was not correctly positioned, this could cause a fault.
- Now unplug the plug -1-.
- Check the contacts at the plug and at the fuel delivery unit for damage.

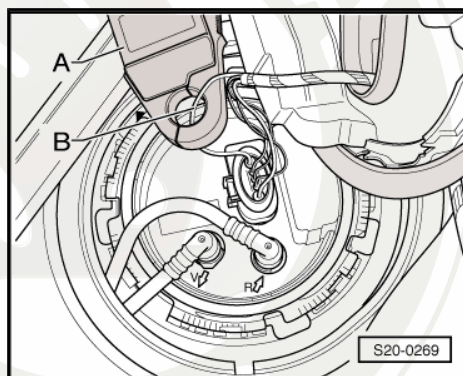
If no damage was detected:

- Fit again plug -1-.



- Connect the current probe -A- of the vehicle diagnosis, measurement and information system -VAS 505X- on the line -B- to contact 1 of the 5-pin plug.

If the current probe cannot be connected on the line -B- to contact 1 of the 5-pin plug because of the length of the insulation:

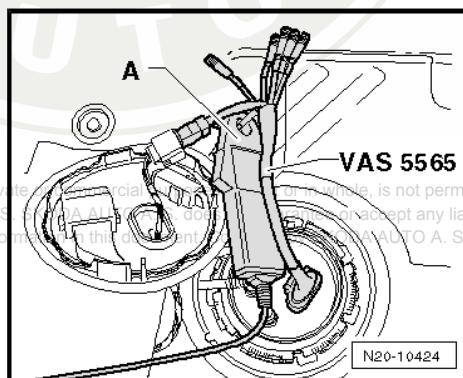


- Connect the adapter for measuring method/DSO (5-pin) -VAS 5565- to the plug connection and to the fuel delivery unit.
- Connect the current probe -A- on the red cable - with the inscription "current probe" - of the adapter for measuring method/DSO (5-pin) -VAS 5565- .

Continued for all

- Start engine and run in idle.
- Measure power consumption of the fuel delivery unit.

Specified value: max. 9 A



Note

If the fault in the fuel supply system is intermittent then tests can be undertaken during a test drive but then two people are required for this.

If the specified current uptake is exceeded:

- Fuel pump defective, replace fuel delivery unit ⇒ [page 122](#) .

2 Electronic Engine Power Control (Electronic throttle)

2.1 Accelerator pedal module - Summary of components

1 - Connector

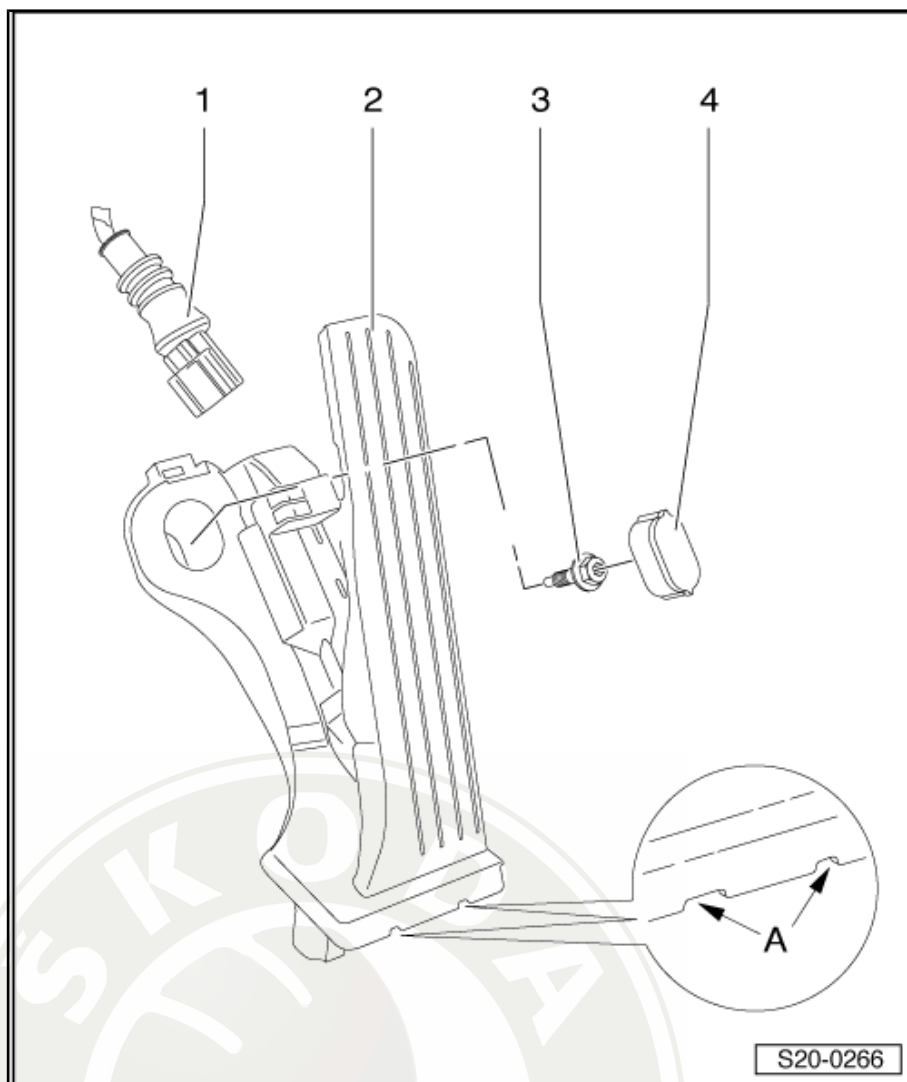
- ☐ black, 6 pin
- ☐ disconnect and fit on
⇒ [page 143](#)

2 - Accelerator pedal position sender -G79- with accelerator pedal position sender 2 -G185-

- ☐ not adjustable
- ☐ -A- openings for release tool
- ☐ removing and installing
⇒ [page 141](#)
- ☐ on vehicles with automatic gearbox with kick-down switch
- ☐ adapt the engine control unit after replacing on vehicles with automatic gearbox ⇒ Vehicle diagnosis, testing and information system VAS 5051

3 - 10 Nm

4 - Cover



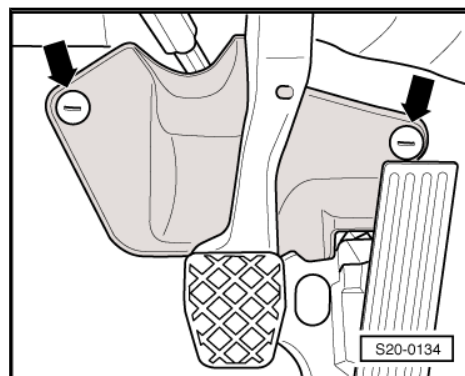
2.2 Removing and installing accelerator pedal module

Special tools and workshop equipment required

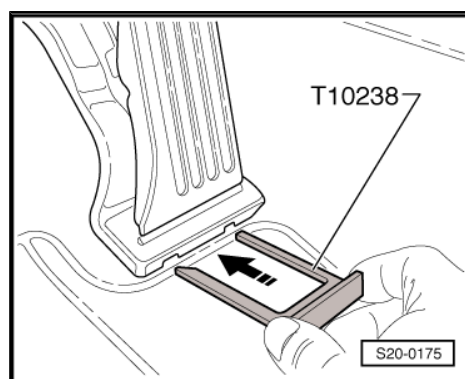
- ◆ Release tool -T10238- (for left-hand drive vehicle)
- ◆ Release tool -T10240- (for right-hand drive vehicle)

Removing

- Remove cover for the steering column -arrows-.
- Lever out the cap (➔ [page 141](#) , position 4) with a screwdriver.
- Unscrew the fixing screw (➔ [page 141](#) , position 3).

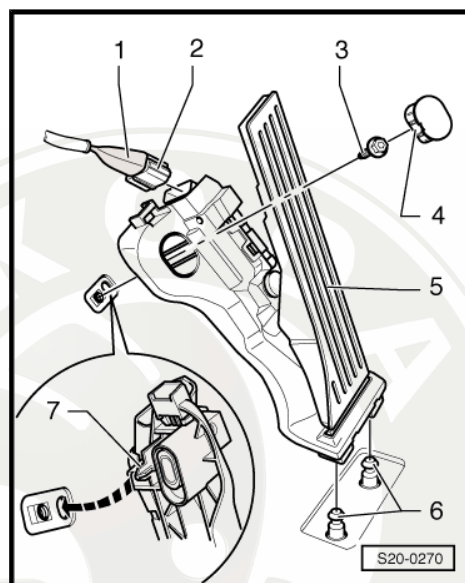


- Push the release tool -T10238 - (on right-hand drive vehicles release tool -T10240 -) as shown up to the stop into the provided openings and remove the accelerator pedal module.
- Disconnect connector at accelerator pedal module ➔ [page 143](#) .



Install

- Fit the connector -2- onto the accelerator pedal module -5- ➔ [page 143](#) .
- Push accelerator pedal module onto the retaining bolts -6-.
- Insert the centering pin -7- into the hole on the underbody.
- Fasten accelerator pedal module with screw -3- (10 Nm) and fit on cap -4-.
- Re-install cover for steering column.
- If the accelerator pedal module was replaced on vehicles with automatic gearbox, the engine control unit must be adapted ➔ Vehicle diagnosis, testing and information system VAS 5051.



2.2.1 Disconnect connector for accelerator pedal module and fit on



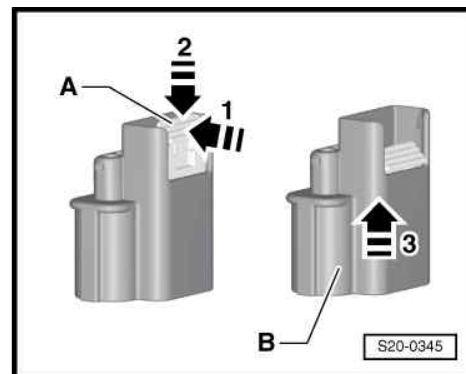
Note

The plugs for the accelerator pedal module which are inserted, must be disconnected and fit on in a different manner.

Disconnect connector 1K0 973 706

- Slightly press the piston slide valve -A- (grey) in -direction of arrow 1- and push it up to the stop in -direction of arrow 2-.
- Hold the piston slide valve in this position and disconnect the socket housing -B- towards the top -direction of arrow 3-.

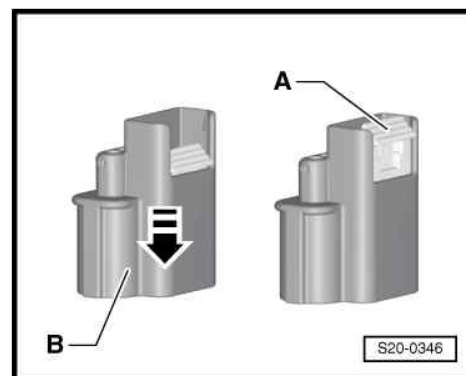
The piston slide valve -A- remains in the bottom position.



Fit on connector 1K0 973 706

- Push the socket housing -B- down -direction of arrow- until the housing can be heard to lock in place.
- For safety reasons, check the connector for secure catch by tightening it in the opposite direction.

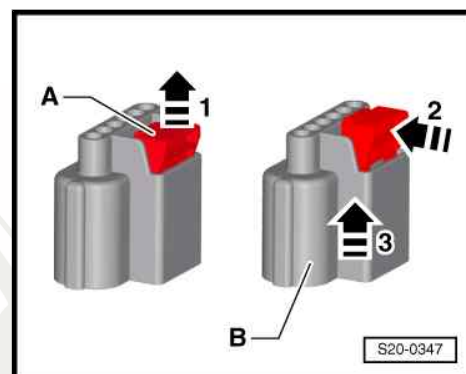
The piston slide valve -A- moves automatically upwards.



Disconnect connector 8K0 973 706

- Pull the piston slide valve -A- (red) upwards -direction of arrow 1- up to the stop.
- Press the piston slide valve in -direction of arrow 2- and disconnect the socket housing -B- upwards -direction of arrow 3-.

The piston slide valve -A- remains in the top position.

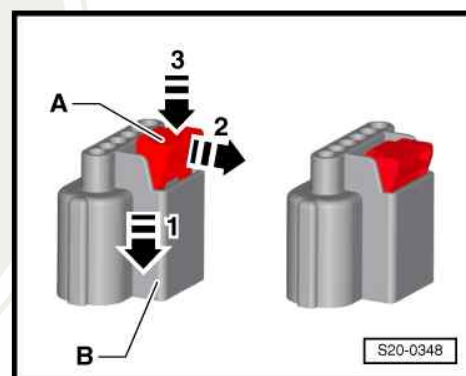


Fit on connector 8K0 973 706

- Push the socket housing -B- downwards up to the stop -direction of arrow 1-.
- Slightly press the piston slide valve in -direction of arrow 2- and push it downwards -direction of arrow 3-.

The piston slide valve -A- can only be pushed downwards if the socket housing was pushed downwards "up to the stop".

- For safety reasons, check the connector for secure catch by tightening it in the opposite direction.



3 Activated charcoal container system

3.1 Activated charcoal container system - Summary of components



Note

- ◆ The hose connections are secured with spring strap clips or clamp-type clips.
- ◆ Always replace clamp-type clips with spring-type clips.
- ◆ Use pliers for spring strap clips to fit the spring strap clips.
- ◆ Safety precautions when working on the fuel supply system ⇒ [page 3](#).
- ◆ Rules of cleanliness when working on the fuel supply system ⇒ [page 5](#).

1 - Activated charcoal filter

- ☐ Fitting position: in right of engine compartment
- ☐ if the catch peg is unlocked, the activated charcoal filter can be removed from the holder
- ☐ Checking the fuel tank venting ⇒ [page 144](#)

2 - Pressure holding valve with connection hose

3 - 8 Nm

4 - Vent line

- ☐ check for firm seating
- ☐ from fuel tank

5 - 8 Nm

6 - Support

- ☐ for activated charcoal filter

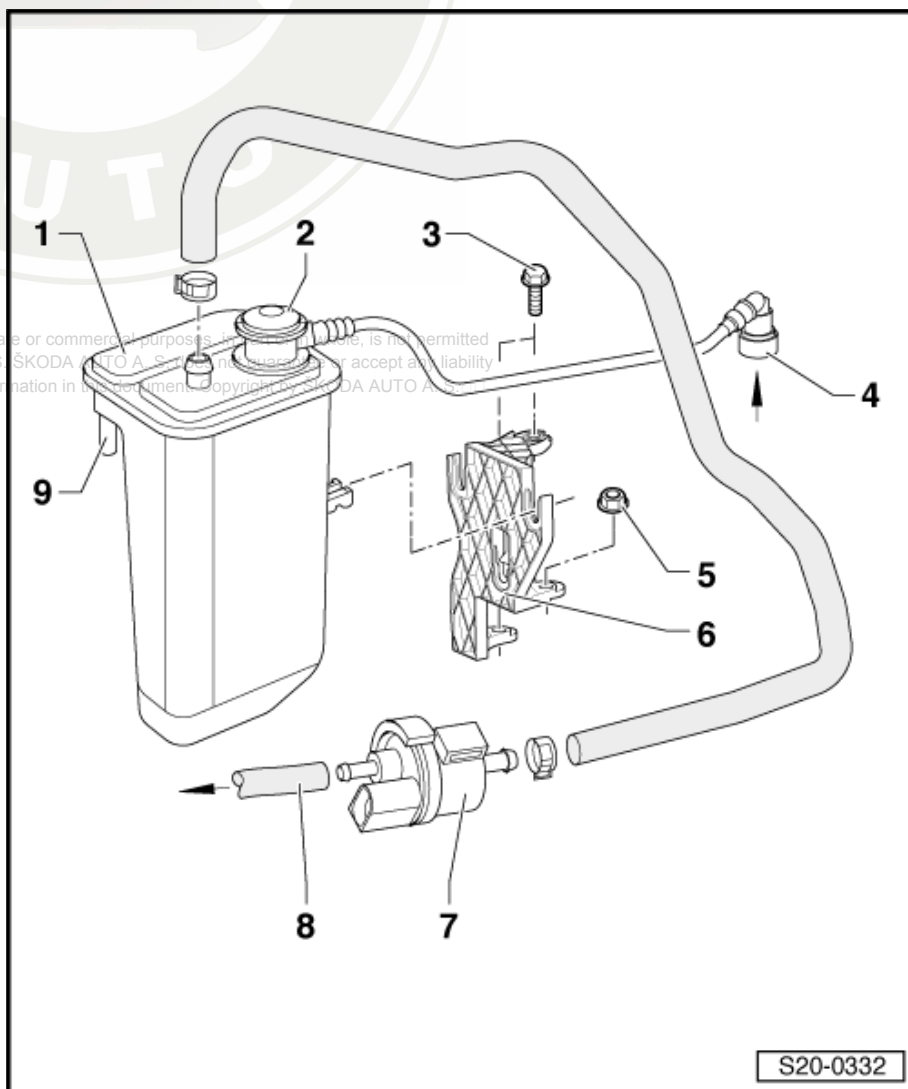
7 - Solenoid valve 1 for activated charcoal filter -N80-

- ☐ Valve closed when ignition is switched off
- ☐ valve is actuated (pulsed) by engine control unit when engine is warm

8 - Connecting hose

- ☐ To intake manifold
- ☐ check for firm seating

9 - Air admission fitting



3.2 Checking the fuel tank venting

Special tools and workshop equipment required

- ◆ Hand vacuum pump , e.g. -VAS 6213-



- ◆ Adapter set , e.g. - V.A.G 1318/17A-
- ◆ Adapter , e.g. -V.A.G 1318/20-1-



Note

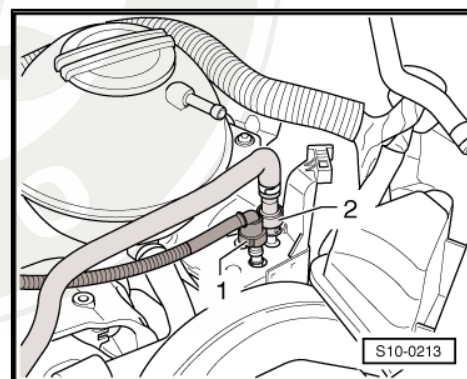
- ◆ *The adapter set -V.A.G 1318/17A- replaces the adapter set -V.A.G 1318/17- .*
- ◆ *The figures shown in the descriptions were not changed for this reason.*

Test condition

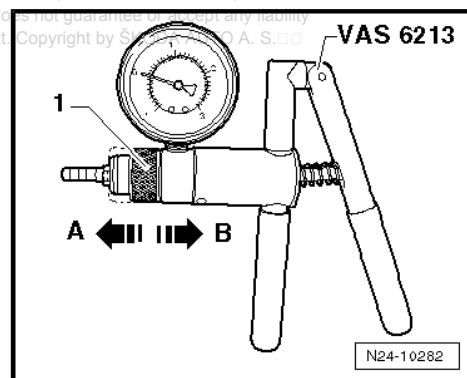
- The ignition must be switched off.

Test sequence

- Detach vent line -1-. To do so press in the securing ring.



- Put the control ring -1- of the hand vacuum pump -VAS 6213- in position -A- for "pressure".

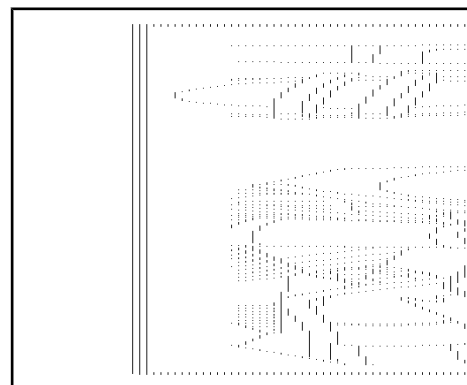


- Then connect the hand vacuum pump -VAS 6213- -1- on the vent line -2- as shown in the figure.
- Operate the hand vacuum pump -VAS 6213- several times.
- No vacuum should build up.

If a vacuum builds up.

- Check the air admission fitting on the activated charcoal filter for dirt and clean as required.

If no vacuum builds up:





- Shut off air admission fitting -arrow- and once again operate the hand vacuum pump several times.
- A vacuum should build up.

If no vacuum builds up:

- Replace activated charcoal filter.



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21 – Turbocharging

1 Exhaust gas turbocharger

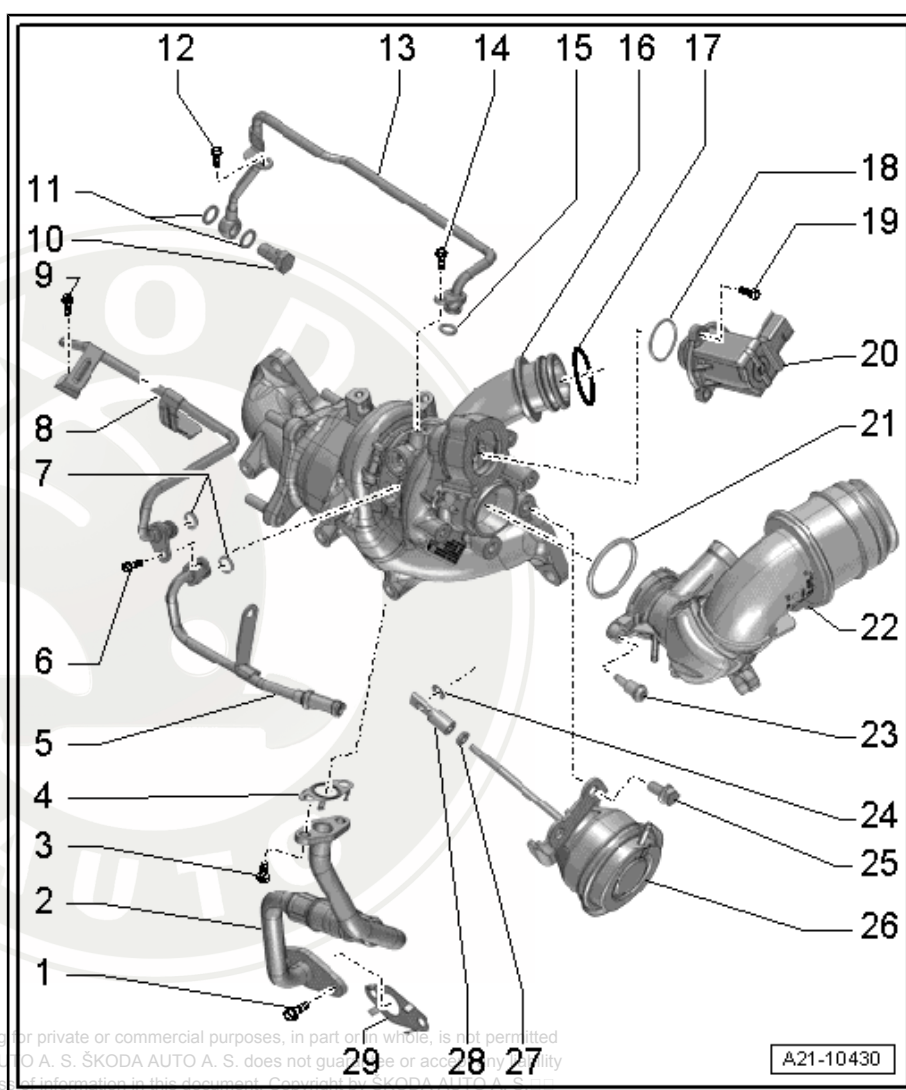
Note

Observe the general notes for assembly work on the charge air system ⇒ [page 7](#).

1.1 Exhaust turbocharger - Summary of components

Part 1

- 1 - 8 Nm
- 2 - Oil return pipe
- 3 - 8 Nm
- 4 - Gasket
☐ replace
- 5 - Coolant pipe
- 6 - 11 Nm
- 7 - O-rings
☐ replace
- 8 - Coolant pipe
- 9 - 8 Nm
- 10 - Hollow screw, 20 Nm
- 11 - Gasket rings
☐ replace
- 12 - 8 Nm
- 13 - Oil feed pipe
- 14 - 8 Nm
- 15 - O-ring
☐ replace
- 16 - Exhaust turbocharger with exhaust manifold
☐ removing and installing
⇒ [page 149](#)
- 17 - O-ring
☐ replace
- 18 - O-ring
☐ replace
- 19 - 11 Nm
- 20 - Turbocharger divert air valve -N249-
- 21 - O-ring
☐ replace



22 - Inlet connection

23 - 10 Nm

24 - Lock washer

- ☐ replace

25 - 20 Nm

26 - Pressure box for turbocharger

- ☐ check ➔ [page 152](#)
- ☐ removing and installing ➔ [page 154](#)
- ☐ adjust ➔ [page 156](#)

27 - Counternut, 10 Nm

28 - Release handle

29 - Gasket

- ☐ replace

Part 2

1 - Heat shield

2 - 16 Nm

- ☐ replace
- ☐ tighten crosswise from the inside outwards
➔ [page 149](#)

3 - Bracket for heat shield

4 - Sealing ring

- ☐ replace

5 - 23 Nm

6 - Heat shield

7 - 10 Nm

8 - Retaining bracket

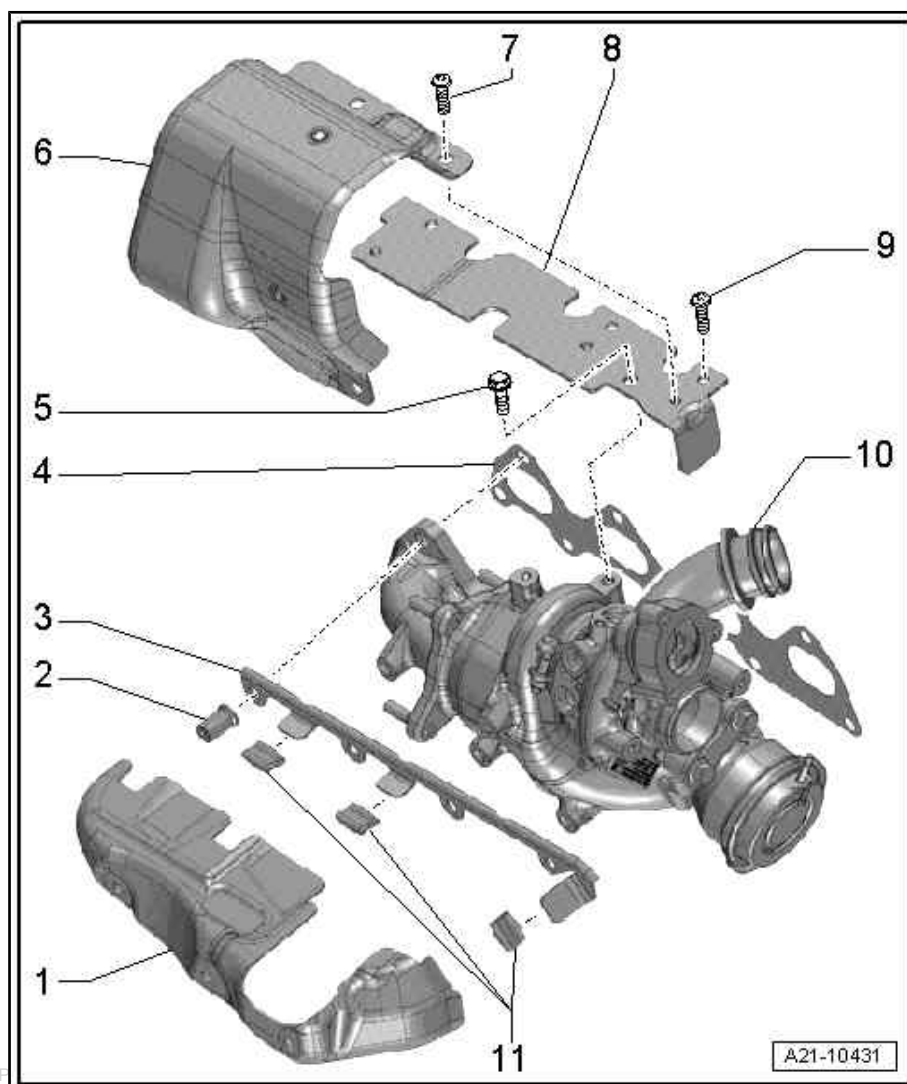
9 - 10 Nm

10 - Exhaust turbocharger with exhaust manifold

- ☐ removing and installing
➔ [page 149](#)

11 - Clamps

- ☐ 3 pieces



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1.2 Removing and installing exhaust gas turbocharger

Special tools and workshop equipment required

- ◆ Hose clamps up to 25 mm -MP7-602 (3094)-
- ◆ Pliers for spring strap clamps
- ◆ Catch pan for workshop crane e.g. - VAS 6208-
- ◆ Hot screw paste -G 052 112 A3-



Caution

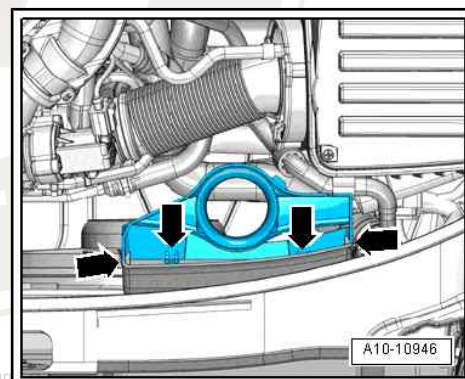
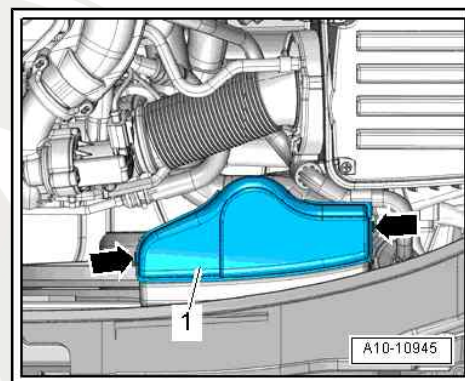
In case a mechanical damage to the exhaust gas turbocharger is found, e.g. damage to the compressor wheel, it is not sufficient to only replace the turbocharger. In order to avoid consequential damage, perform the following tasks:

- ◆ *Clean all oil lines.*
- ◆ *Change the engine oil and replace the oil filter*
- ◆ *Inspect the air filter housing, the air filter element and the intake hoses for contaminations.*
- ◆ *Inspect the whole charge-air routing and the charge air cooler for foreign bodies.*

If foreign bodies are detected in the charge air system, the complete charge-air routing must be cleaned and if necessary the charge air cooler must also be replaced.

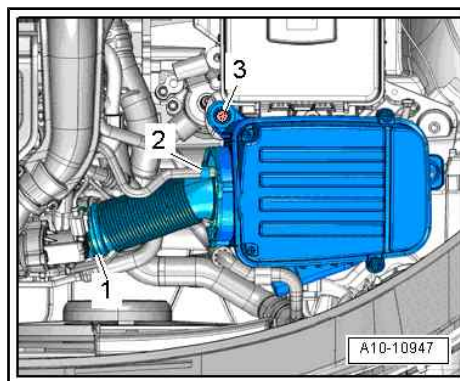
Removing

- Remove engine cover ⇒ [page 9](#) .
- Remove the cover -1- for the connection fitting, to do so release the lateral retaining clasps -arrows-.
- Unclip connection fitting, to do so release retaining clasps -arrows-.

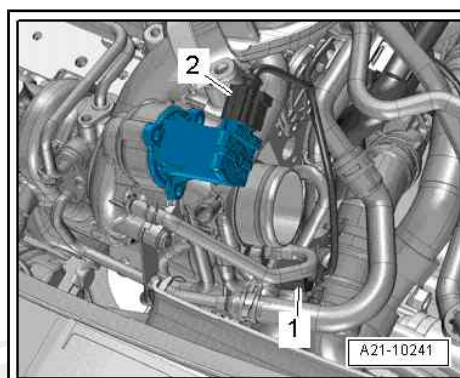


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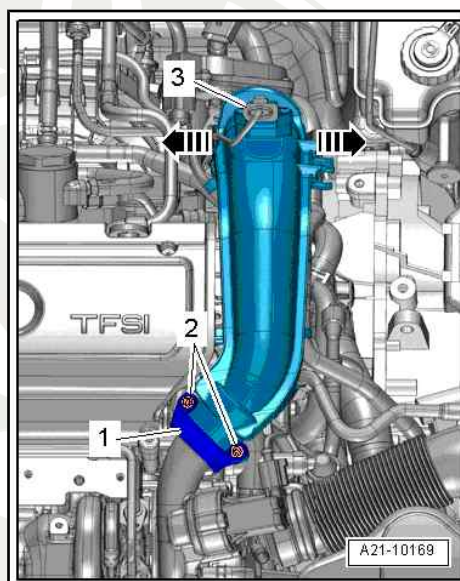
- Slacken hose clamp -1- and remove air guide hose from turbocharger.
- Remove catalytic converter ⇒ [page 196](#) .



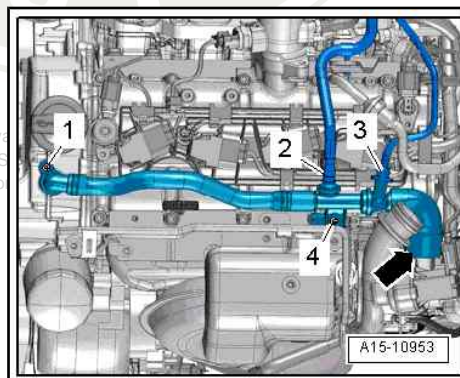
- Disconnect the plug -1- from the charge pressure control solenoid valve -N75- and the plug -2- from the turbocharger divert air valve -N249- .



- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Release fixing screws -2- and remove mounting bracket -1-.
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.

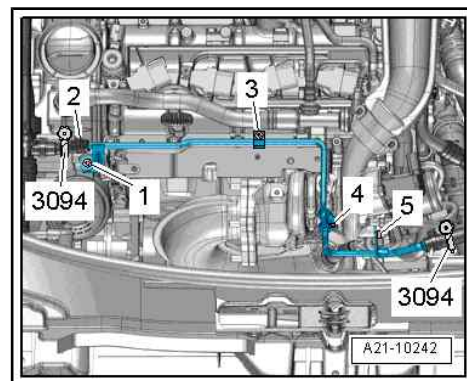


- Unscrew screw -4- and remove the crankcase ventilation hose from the exhaust turbocharger -arrow-.

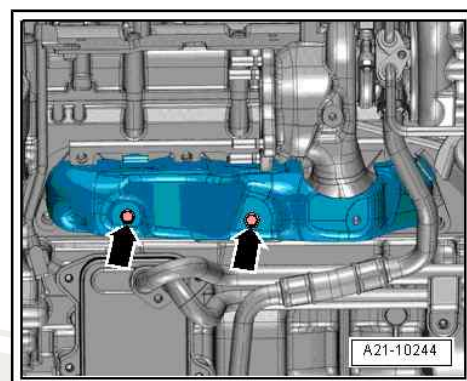


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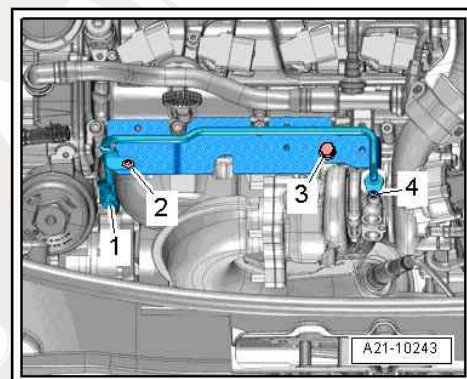
- Pinch off coolant hoses with hose clamps -MP7-602 (3094)- as shown in the figure.
- Place a catch pan under the engine.
- Release screws -1, 3, 4, 5-.
- Remove the coolant lines from the exhaust turbocharger and place them to the side.



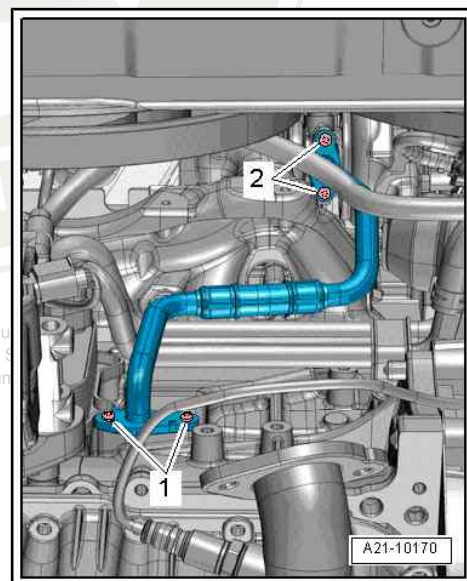
- Release fixing screws -arrows- and remove the heat shield from the exhaust manifold.



- Release the fixing screws -2- and -4- of the oil feed pipe.
- Unscrew the hollow screw -1- from the timing case and remove the coolant pipe.
- Unscrew the fixing screw -3- and remove the retaining bracket.



- Unscrew the fixing screws -1- and -2- of the oil return pipe and remove the pipe.



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- Unscrew all the fixing nuts of the exhaust manifold -arrows- and remove the bracket -1- from the stud bolts.
- Remove exhaust manifold with turbocharger from cylinder head.

Install

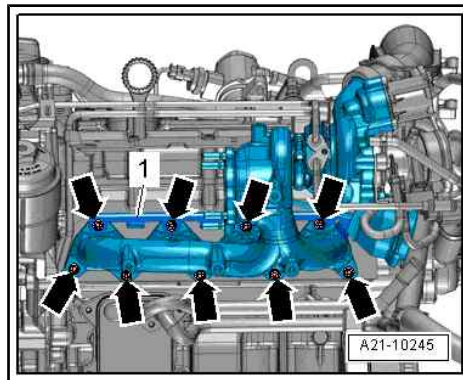


Caution

In case a mechanical damage to the exhaust gas turbocharger is found, e.g. damage to the compressor wheel, it is not sufficient to only replace the turbocharger. In order to avoid consequential damage, perform the following tasks:

- ◆ *Clean all oil lines.*
- ◆ *Change the engine oil and replace the oil filter*
- ◆ *Inspect the air filter housing, the air filter element and the intake hoses for contaminations.*
- ◆ *Inspect the whole charge-air routing and the charge air cooler for foreign bodies.*

If foreign bodies are detected in the charge air system, the complete charge-air routing must be cleaned and if necessary the charge air cooler must also be replaced.



Installation is performed in the reverse order, pay attention to the following points:

- ◆ Gaskets, gasket rings and self-locking nuts must be replaced.
- ◆ Coat the stud bolts at the cylinder head with hot bolt paste -G 052 112 A3- before installing.
- ◆ Fill the exhaust turbocharger with engine oil at the connection fitting for the oil feed line.
- ◆ After installing the turbocharger, run engine at idling speed for about 1 minute to ensure that oil is supplied to the turbocharger.
- ◆ Secure all hose connections with hose clamps ⇒ Electronic Catalogue of Original Parts .

Tightening torques:

Exhaust gas turbocharger - tightening torque and tightening order

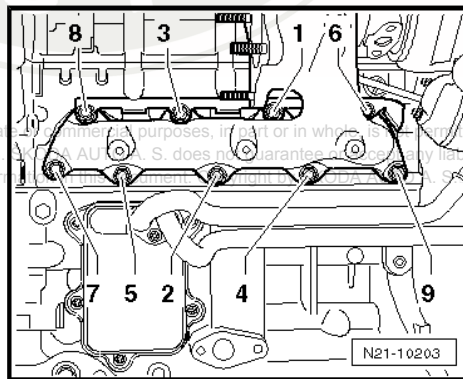
- First tighten the new nuts by hand in such a way that they are correctly positioned and then tighten in the sequence -1 ... 9- to 16 Nm.

Exhaust turbocharger - Summary of components

⇒ [page 147](#) .

Catalytic converter and component parts - Summary of components ⇒ [page 194](#) .

- Inspect coolant level, if necessary top up cooling system and bleed ⇒ [page 103](#) .



1.3 Testing exhaust turbocharger pressure box

Special tools and workshop equipment required

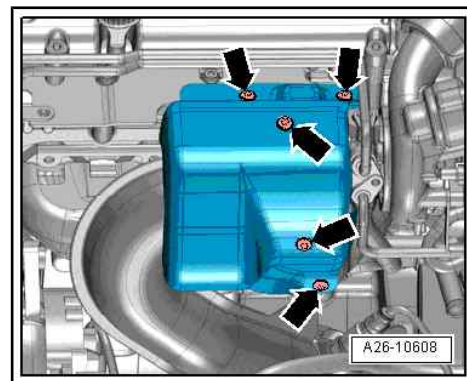
- ◆ Hand vacuum pump , e.g. -VAS 6213-

Test requirements

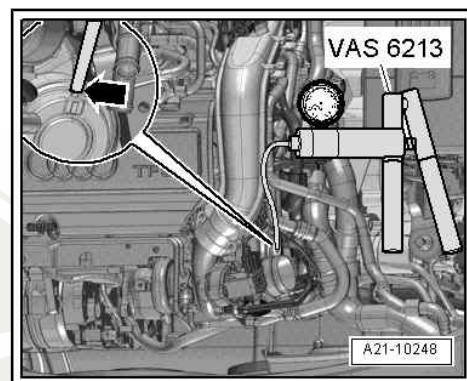
- The hose for the exhaust turbocharger above the charge pressure control solenoid valve -N75- must have access to the pressure unit and must be tight.
- charge pressure control solenoid valve -N75- o.k.

Work procedure

- Release screws -arrows- and remove heat shield for exhaust turbocharger.



- Detach the vacuum hose -arrow- from the exhaust turbocharger pressure unit and instead connect the hand vacuum pump -VAS 6213- .



- Put the control ring -1- of the hand vacuum pump -VAS 6213- in position -B- for "pressure".
- Operate the hand vacuum pump -VAS 6213 - several times.



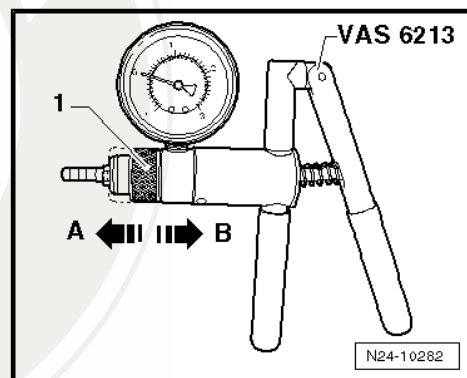
Caution

*Risk of damage to the pressure box from excessive pressure.
The pressure must not be greater than 0.08 MPa (800 mbar).*



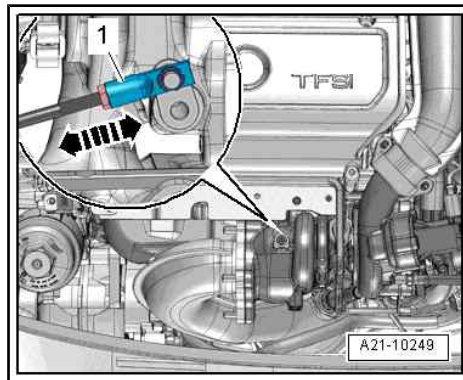
Note

The fitting position with the exhaust turbocharger removed is shown in the illustration.



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- Observe the actuator rod -1- of the exhaust turbocharger pressure unit.
- The actuator rod must move at approx. 0.03 MPa (300 mbar).
- The actuator rod must be at the end of the adjustment path at approx. 0.08 MPa (800 mbar).



- Ventilate the hand vacuum pump -VAS 6213- -arrow A-.
- The actuator rod must move in the reverse direction.

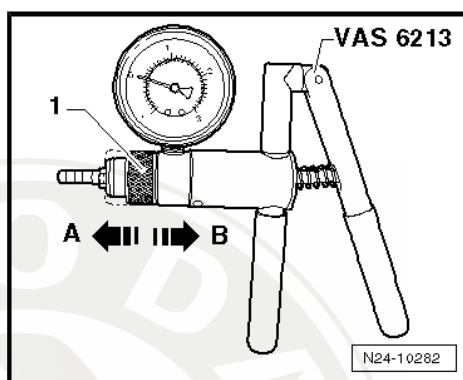


Note

Observe the motion sequence of the actuator rod over the entire adjustment range. It must move continuously and without jolting.

Installation is performed in the reverse order, pay attention to the following points:

- ♦ Tightening torque of heat shield for exhaust turbocharger: 8 Nm



1.4 Removing and installing pressure box for exhaust turbocharger

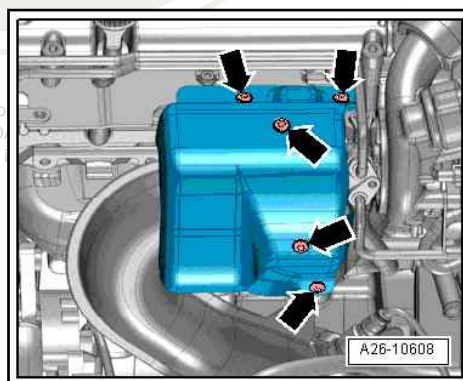
Special tools and workshop equipment required

- ♦ Hose clamps up to 25 mm -MP7-602 (3094)-
- ♦ Pliers for spring strap clamps
- ♦ Catch pan for workshop crane e.g. - VAS 6208-

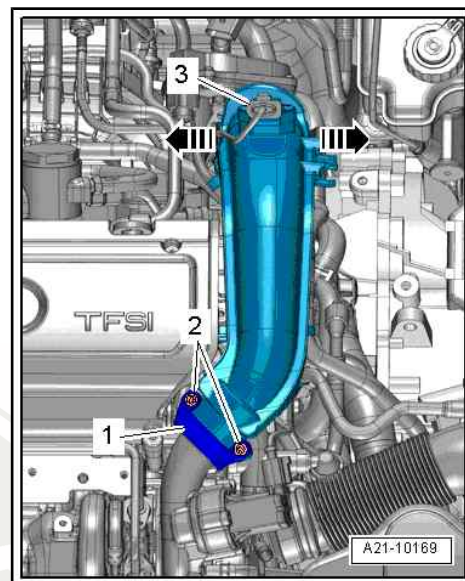
Removing

- Remove engine cover ➔ [page 9](#) .
- Remove the air filter housing ➔ [page 176](#) .
- Release screws -arrows- and remove heat shield for exhaust turbocharger.

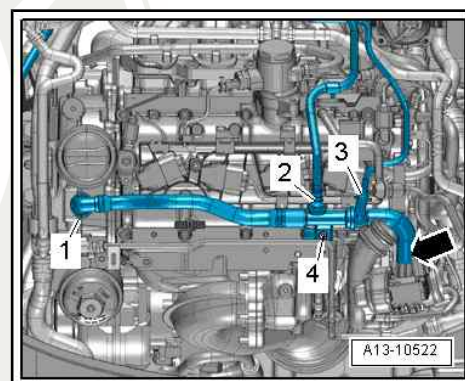
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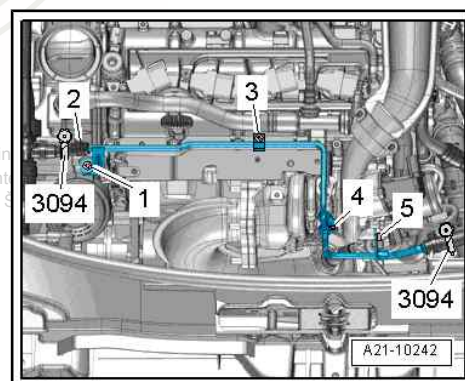
- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.



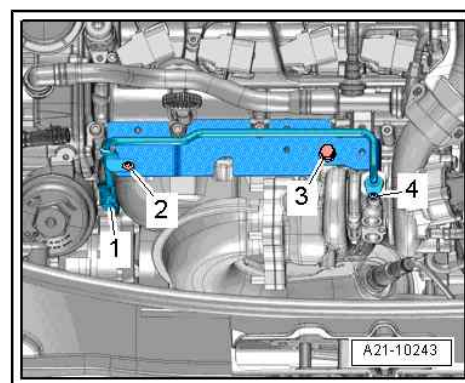
- Unscrew screw -4- and remove the crankcase ventilation hose from the exhaust turbocharger -arrow- and place it to the side.



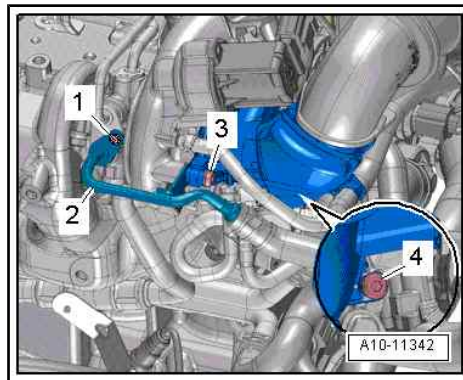
- Pinch off coolant hoses with hose clamps -3094- as shown in the figure.
- Release screws -1, 3, 4, 5-.
- Place a catch pan under the engine.
- Remove the coolant lines from the exhaust turbocharger and place them to the side.



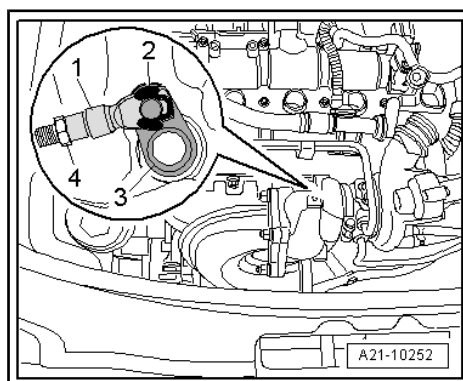
- Release screws -2- and -3-, remove retaining bracket.



- Release screws -3- and -4-, remove support and push to the side.



- Lever off the circlip -2- and remove the threaded piece -1- of the actuator rod from the bolt of the operating lever -3-.

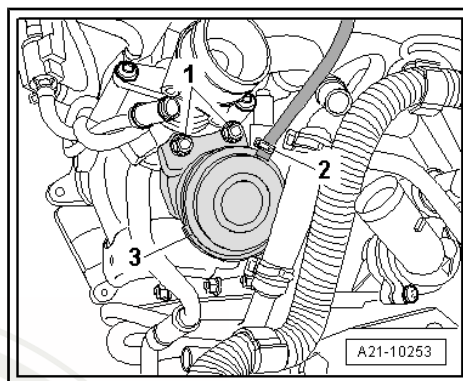


- Remove the hose -2- from the exhaust turbocharger pressure unit.
- Release screws -1- and remove exhaust turbocharger pressure unit -3-.

Install

Installation is performed in the reverse order, pay attention to the following points:

- ♦ Tightening torques: ➔ [page 147](#)
- ♦ Tightening torque of heat shield for exhaust turbocharger: 8 Nm
- Setting exhaust turbocharger pressure unit ➔ [page 156](#) .
- Inspect coolant level, if necessary top up cooling system and bleed ➔ [page 103](#) .



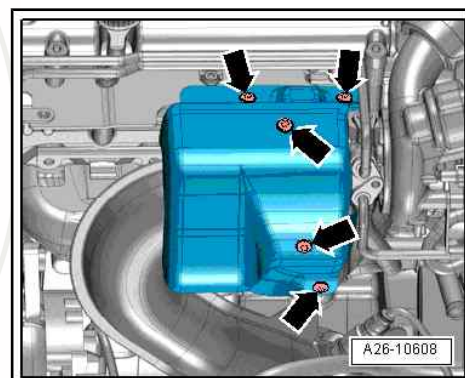
1.5 Setting exhaust turbocharger pressure unit

Special tools and workshop equipment required

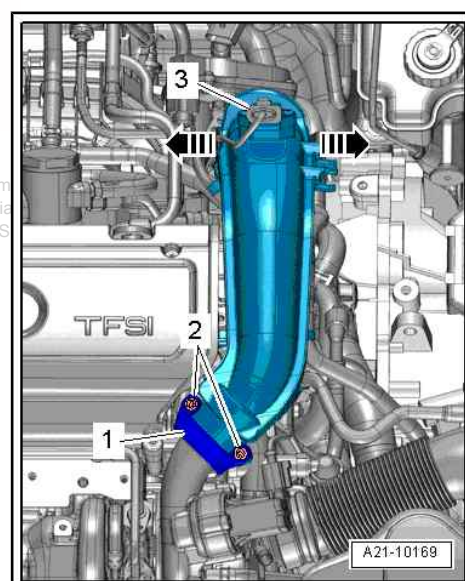
- ♦ Universal dial gauge holder -MP 3-447 (VW 387)-
- ♦ Hand vacuum pump , e.g. -VAS 6213-
- ♦ Pressure control valve , e.g. -VAS 6342-
- ♦ Turbocharger tester , e.g. - V.A.G 1397 A-
- ♦ Dial gauge , e.g. -VAS 6341/1-
- ♦ Flat button , e.g. -VAS 6341/4-
- ♦ Hose clamps up to 25 mm -MP7-602 (3094)-
- ♦ Pliers for spring strap clamps
- ♦ Catch pan for workshop crane e.g. - VAS 6208-

Work procedure

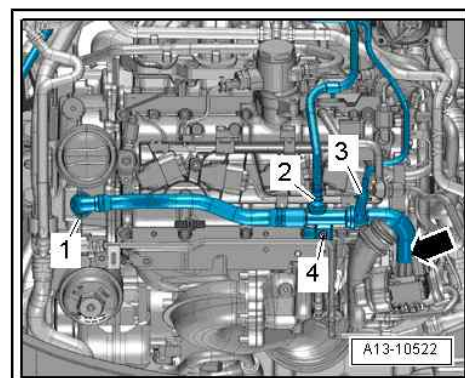
- Remove engine cover ⇒ [page 9](#) .
- Remove the air filter housing ⇒ [page 176](#) .
- Release screws -arrows- and remove heat shield for exhaust turbocharger.



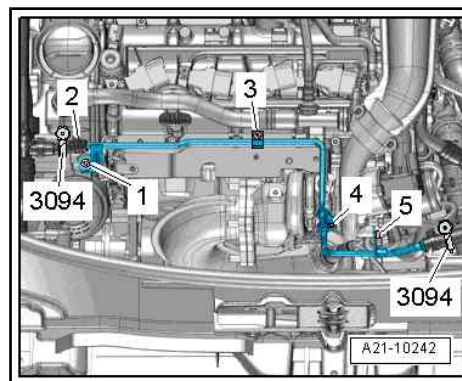
- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.



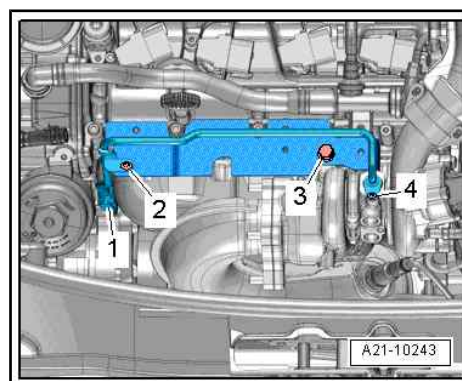
- Unscrew screw -4- and remove the crankcase ventilation hose from the exhaust turbocharger -arrow- and place it to the side.



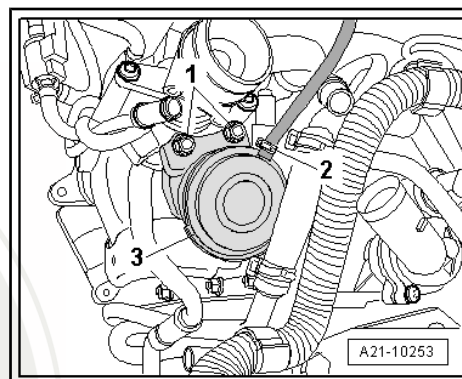
- Pinch off coolant hoses with hose clamps -MP7-602 (3094)- as shown in the figure.
- Release screws -1, 3, 4, 5-.
- Place a catch pan under the engine.
- Remove the coolant lines from the exhaust turbocharger and place them to the side.



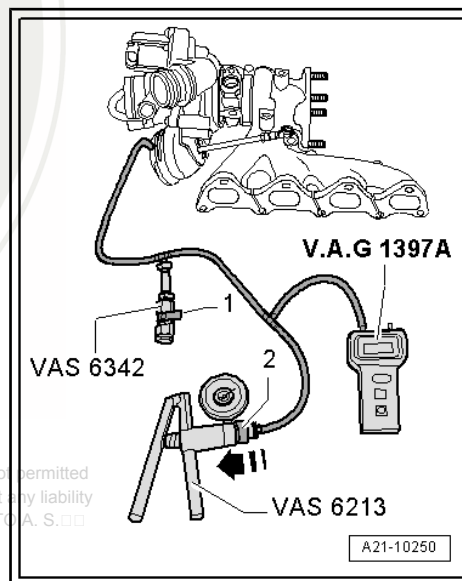
- Release screws -2- and -3-, remove retaining bracket.
- Remove catalytic converter ➔ [page 196](#) .



- Remove the hose -2- from the exhaust turbocharger pressure unit.



- Fit together the measurement and test equipment as shown in the figure and connect them at the connection "II" of the turbocharger tester -V.A.G 1397A- as well as on the exhaust turbocharger pressure unit.
- Connect the lever -1- at the pressure control valve - VAS 6342- .
- Position the sliding ring -2- of the hand vacuum pump -VAS 6213- in the -direction of arrow-.



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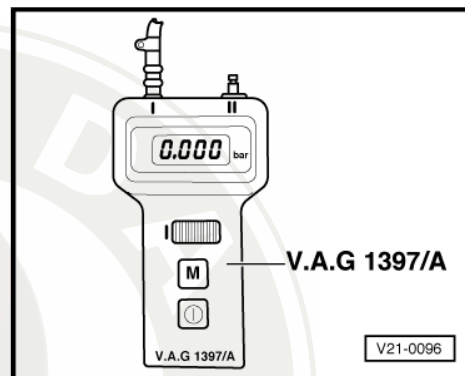


- Switch on the turbocharger tester -V.A.G 1397A- and position the sliding switch to position “II”.
- Operate the hand vacuum pump -VAS 6213- several times until a pressure of approx. 0.08 MPa (800 mbar) is reached.

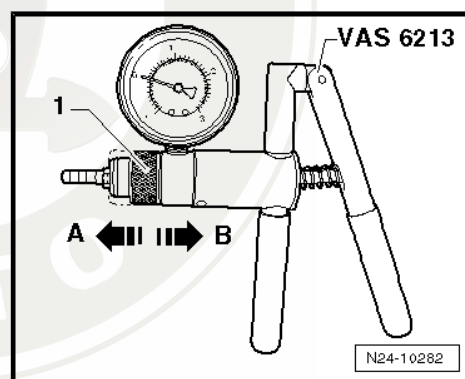


Caution

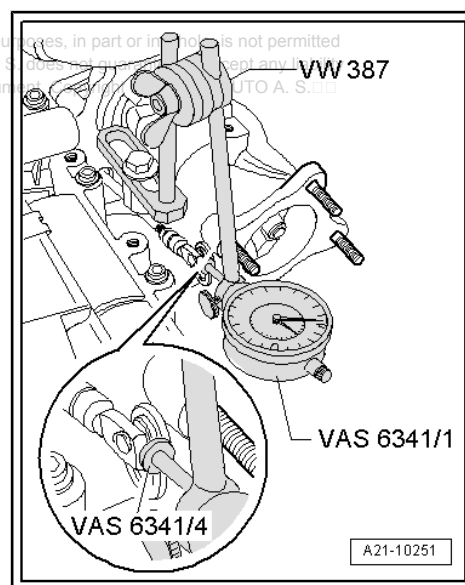
*Risk of damage to the pressure box from excessive pressure.
The pressure must not be greater than 0.08 MPa (800 mbar).*



- Ventilate the hand vacuum pump -VAS 6213- -arrow A- so that the linkage of the charge pressure control can move freely in the exhaust turbocharger.
- Repeat the process 5 times.



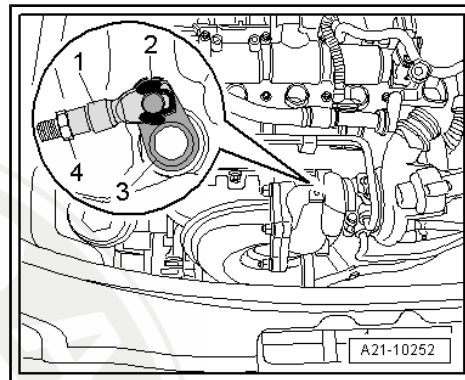
- Attach the universal dial gauge holder -VW 387- to the exhaust turbocharger as shown in the figure.
- Attach the dial gauge -VAS 6341/1- with the flat button -VAS 6341/4- at the universal dial gauge holder -VW 387- .
- At 0 MPa (0 bar) set the dial gauge -VAS 6341/1- to 1 mm preload.
- Set the readout of the dial gauge -VAS 6341/1- to “0”.
- Operate the hand vacuum pump -VAS 6213- several times until the turbocharger tester -V.A.G 1397A- indicates a pressure of 0.043 MPa (430 mbar).
- Nominal value on the dial gauge -VAS 6341/1- : 1 mm stroke.





Note

- ◆ If the nominal value is not reached, loosen the counternut -4-.
- ◆ Lever off the circlip -2- and remove the threaded piece -1- from the bolt of the operating lever -3-.
- ◆ Unscrew the threaded piece from the actuator rod sufficiently until the nominal value is reached. Fit the threaded piece each time onto the bolt of the operating lever for checking.
- ◆ Secure the threaded piece with the circlip -2- onto the bolt of the operating lever and tighten the counternut -4-.



Check the setting of the pressure unit

- At 0 MPa (0 bar) set the dial gauge -VAS 6341/1- to 1 mm preload.

Measurement 1:

- Operate the hand vacuum pump -VAS 6213- several times until the turbocharger tester -V.A.G 1397A- indicates a pressure of 0.075...0.080 MPa (750....800 mbar).
- Release the pressure via the pressure control valve -VAS 6342- to 0.042 MPa (420 mbar).
- Read off stroke on the dial gauge -VAS 6341/1- and note.
- Release the pressure via the pressure control valve -VAS 6342- to 0 MPa (0 bar).
- Operate the hand vacuum pump -VAS 6213- several times until the turbocharger tester -V.A.G 1397A- indicates a pressure of 0.042 MPa (420 mbar).
- Read off stroke on the dial gauge -VAS 6341/1- and note.
- Calculate the mean value, to do so add the value "1" and "2" together and divide by 2.
- Specified value: 1 mm

Measurement 2:

- Operate the hand vacuum pump -VAS 6213- several times until the turbocharger tester -V.A.G 1397A- indicates a pressure of 0.075...0.080 MPa (750....800 mbar).
- Release the pressure via the pressure control valve -VAS 6342- to 0.052 MPa (520 mbar).
- Read off stroke on the dial gauge -VAS 6341/1- and note.
- Release the pressure via the pressure control valve -VAS 6342- to 0 MPa (0 bar).
- Set the readout of the dial gauge -VAS 6341/1- to "0".
- Operate the hand vacuum pump -VAS 6213- several times until the turbocharger tester -V.A.G 1397A- indicates a pressure of 0.052 MPa (520 mbar).
- Read off stroke on the dial gauge -VAS 6341/1- and note.
- Calculate the mean value, to do so add the value "1" and "2" together and divide by 2.
- Specified value: 5 mm
- If the nominal values are not reached, repeat setting.



Installation occurs in reverse order for removal, while paying attention to the following:

- ◆ Tightening torques: ⇒ [page 147](#)
- ◆ Tightening torque of heat shield for exhaust turbocharger: 8 Nm
- Install catalytic converter ⇒ [page 149](#) .
- Inspect coolant level, if necessary top up cooling system and bleed ⇒ [page 103](#) .



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2 Charge air system with exhaust gas turbocharger

Observe the general notes for assembly work on the charge air system ➔ [page 7](#).

2.1 Charge air system - Summary of components



Note

- ◆ On this engine, the charge-air cooler is located in the intake manifold and is not cooled through air yet through water ➔ [page 102](#).
- ◆ The additional radiator for coolant of charge air system which is necessary for this, is located as previously in the lock carrier and is cooled through air.

1 - Additional radiator for coolant of charge air system

- ☐ with top and bottom sealing strips
- ☐ removing and installing ➔ [page 163](#)

2 - O-ring

- ☐ replace if damaged

3 - Top coolant hose

- ☐ connection diagram for coolant hoses ➔ [page 102](#)

4 - Spring strap clamp

- ☐ use spring strap clips, e.g. -VAS 6340-, for removing and installing

5 - Connecting pipe

6 - Coolant hose

- ☐ to the expansion reservoir

7 - Grommet

8 - Coolant hose

- ☐ to exhaust gas turbocharger

9 - Coolant hose

10 - Intake manifold

- ☐ removing and installing ➔ [page 174](#)

11 - Gasket

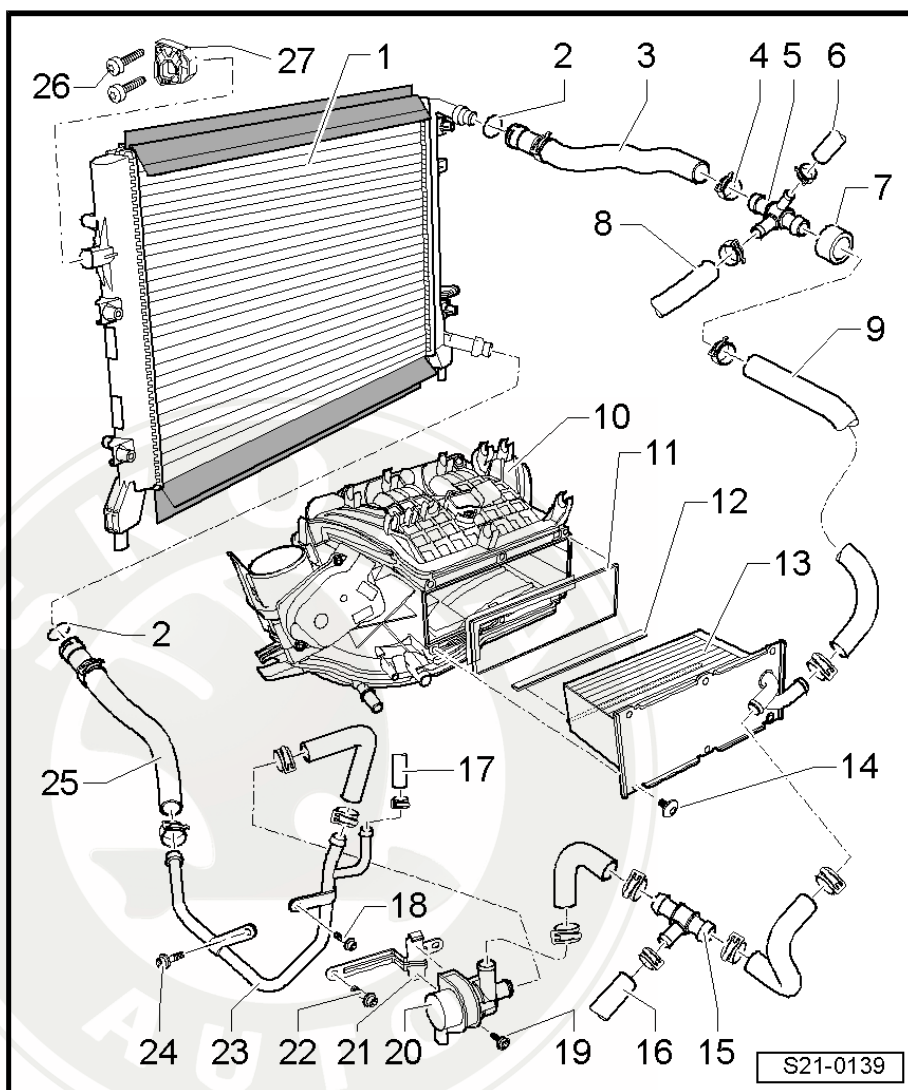
- ☐ replace if damaged

12 - Seal

- ☐ pay attention to correct seating when installing the charge air cooler

13 - Charge air cooler

- ☐ to remove take off intake manifold ➔ [page 174](#)





14 - 7 Nm

- ☐ when installing first tighten evenly by hand, then tighten to tightening torque

15 - Connecting pipe

16 - Coolant hose

- ☐ connection diagram for coolant hoses ➔ [page 102](#)

17 - Coolant hose

- ☐ connection diagram for coolant hoses ➔ [page 102](#)

18 - 8 Nm

19 - 8 Nm

20 - Coolant recirculation pump -V50-

- ☐ removing and installing ➔ [page 108](#)

21 - Support

22 - 20 Nm

23 - Coolant pipe

24 - 8 Nm

25 - Bottom coolant hose

26 - 7 Nm

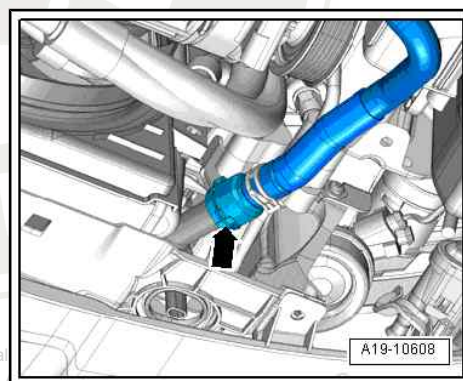
27 - Bearings

- ☐ for additional radiator for coolant of charge air system

2.2 Removing and installing the additional radiator for coolant of charge air system

Removing

- Drain the coolant from the engine cooling system and the charge air cooling system ➔ [page 103](#).
- Separate the coolant hose (quick coupling) -arrow- on the bottom connection fitting of the additional radiator for coolant of charge air system.



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- Separate the coolant hose (quick coupling) -arrow- on the top connection fitting of the additional radiator for coolant of charge air system.
- Remove radiator ➔ [page 112](#) .
- Remove front bumper ➔ Body Work; Rep. Gr. 63 .

On vehicles with air conditioning



WARNING

Do not open the refrigerant circuit of the air conditioning system.



Caution

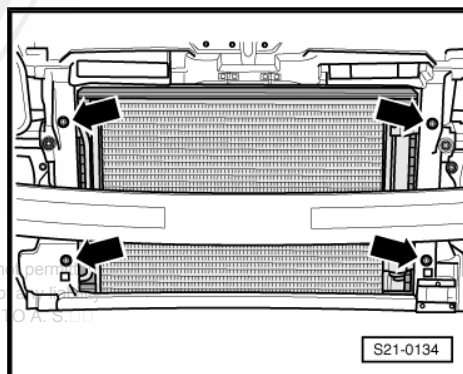
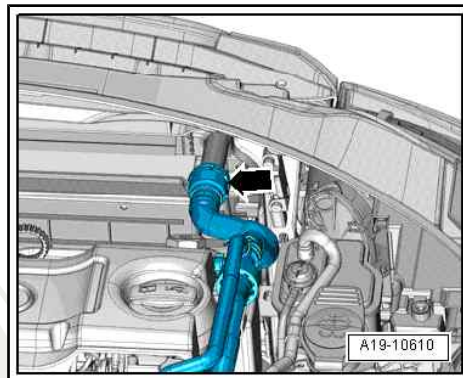
In order to avoid damage to the condenser as well as to the refrigerant lines and hoses, ensure that the lines and hoses are not over-tensioned, kinked or bent.

- Release the securing bolts -arrows- of the condenser.

For all vehicles

- Unscrew fixing screws for charge air cooler on right and left (➔ [page 162](#) , Pos. 26).

On vehicles with air conditioning



- Press off the charge air cooler from the lock carrier with the assistance of a 2nd mechanic so that the fixing screw -1- for the refrigerant lines on the radiator is accessible.
- Remove screw -1-.

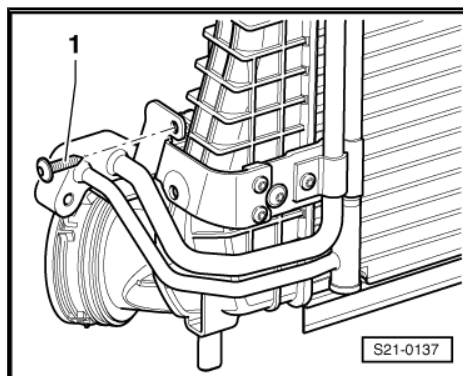
For all vehicles

- Carefully remove the additional radiator for coolant of charge air system downwards.

Install

Installation is carried out in the reverse order. Pay attention to the following:

- Top up and bleed cooling system ➔ [page 103](#) .



24 – Fuel Formation, Injection

1 Fitting location of the injection system

Right engine compartment side

1 - Control valve for fuel pressure -N276-

2 - High pressure pump with fuel pressure regulating valve -N276-

- ☐ removing and installing
⇒ [page 179](#)

3 - Solenoid valve 1 for activated charcoal filter -N80-

4 - Intake air temperature sender -G42- and intake manifold pressure sender -G71-

5 - Engine control unit -J623-

- ☐ removing and installing
⇒ [page 192](#)

6 - Knock sensor 1 -G61-

- ☐ at rear cylinder block
- ☐ 20 Nm

7 - Engine speed sender -G28-

- ☐ removing and installing
⇒ [page 203](#)

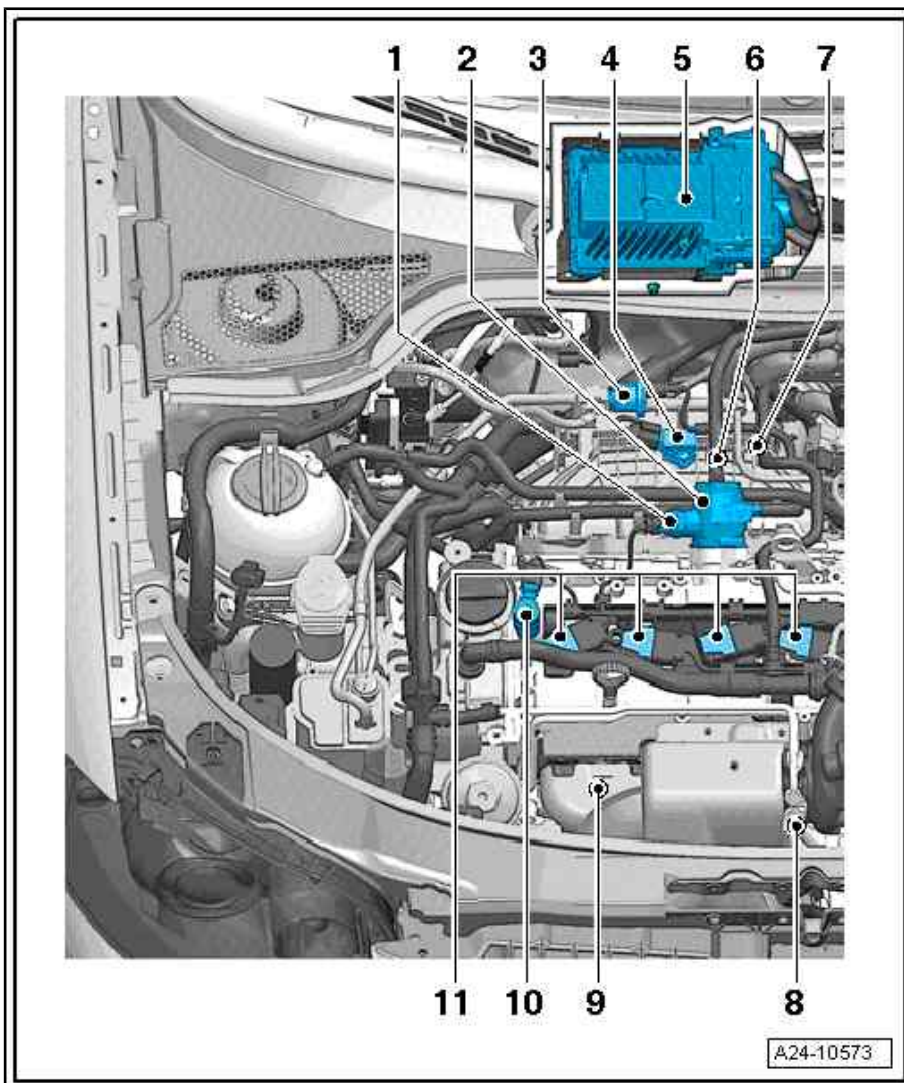
8 - lambda probe -G39- and heating for lambda probe -Z19-

9 - Lambda probe downstream of catalytic converter -G130- and heater of lambda probe 1 downstream of catalytic converter -Z29-

10 - Camshaft adjustment valve 1 -N205-

11 - Ignition coils with a power output stage

- ☐ removing and installing ⇒ [page 202](#)



Left engine compartment side

1 - Hall sender -G40-

2 - Throttle valve control unit - J338-

- ☐ removing and installing
⇒ [page 171](#)
- ☐ clean ⇒ [page 173](#)
- ☐ in case of replacement,
erase initialisation values and adapt the engine control unit -J623-
⇒ Vehicle diagnosis, testing and information system VAS 5051.

3 - Fuel pressure sender - G247-

- ☐ check ⇒ [page 187](#)

4 - Charge pressure sender - G31- with intake air temperature sender 2 -G299-

5 - Clutch position sender - G476-

6 - Coolant temperature sender at radiator outlet -G83-

7 - Coolant temperature sender -G62-

8 - electrical plug connections of the lambda probes

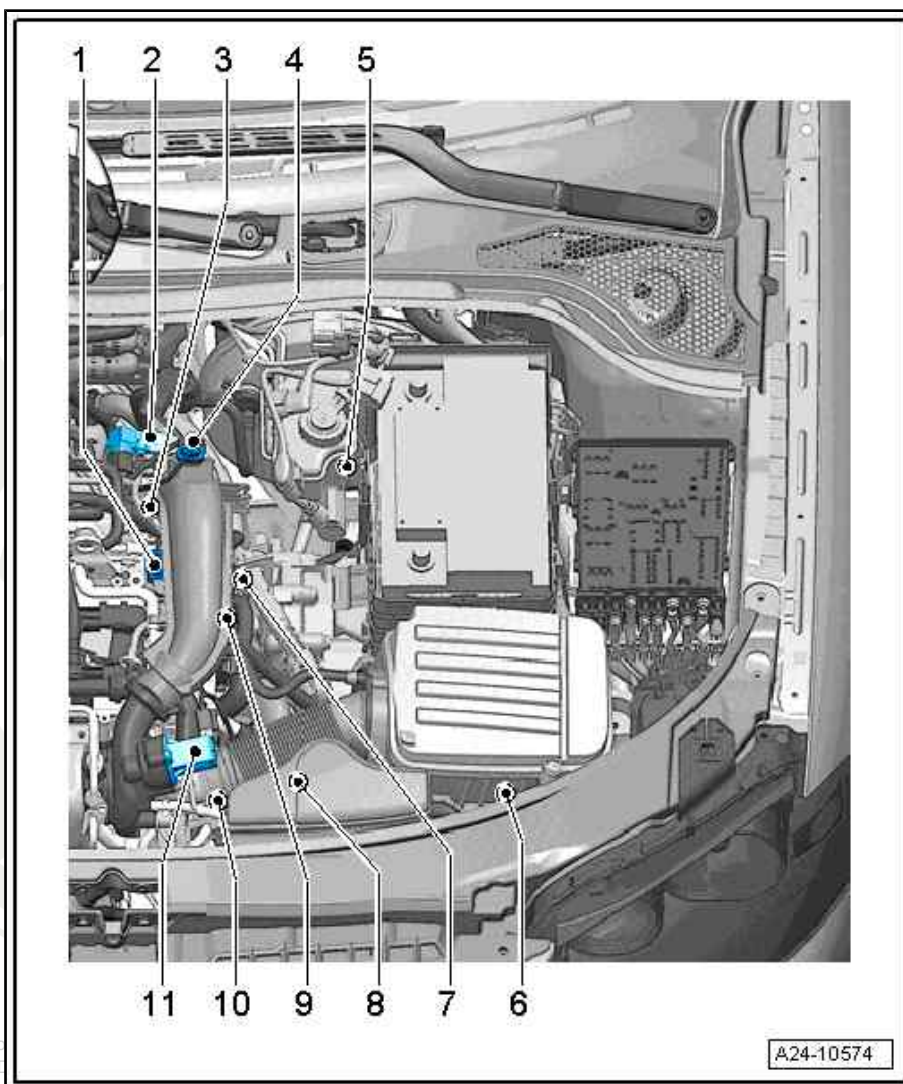
9 - Oil pressure switch -F1-

- ☐ in the left cylinder head
- ☐ check ⇒ [page 100](#)

10 - Solenoid valve for charge pressure control -N75-

- ☐ screwed onto the exhaust turbocharger

11 - Turbocharger divert air valve -N249-



Engine - suction side

1 - Knock sensor 1 -G61-

- ❑ Summary of components ➔ [page 201](#)

2 - Throttle valve control unit - J338-

- ❑ removing and installing ➔ [page 171](#)
- ❑ clean ➔ [page 173](#)
- ❑ in case of replacement, erase initialisation values and adapt the engine control unit -J623- ➔ Vehicle diagnosis, testing and information system VAS 5051.

3 - Charge pressure sender - G31- with intake air temperature sender 2 -G299-

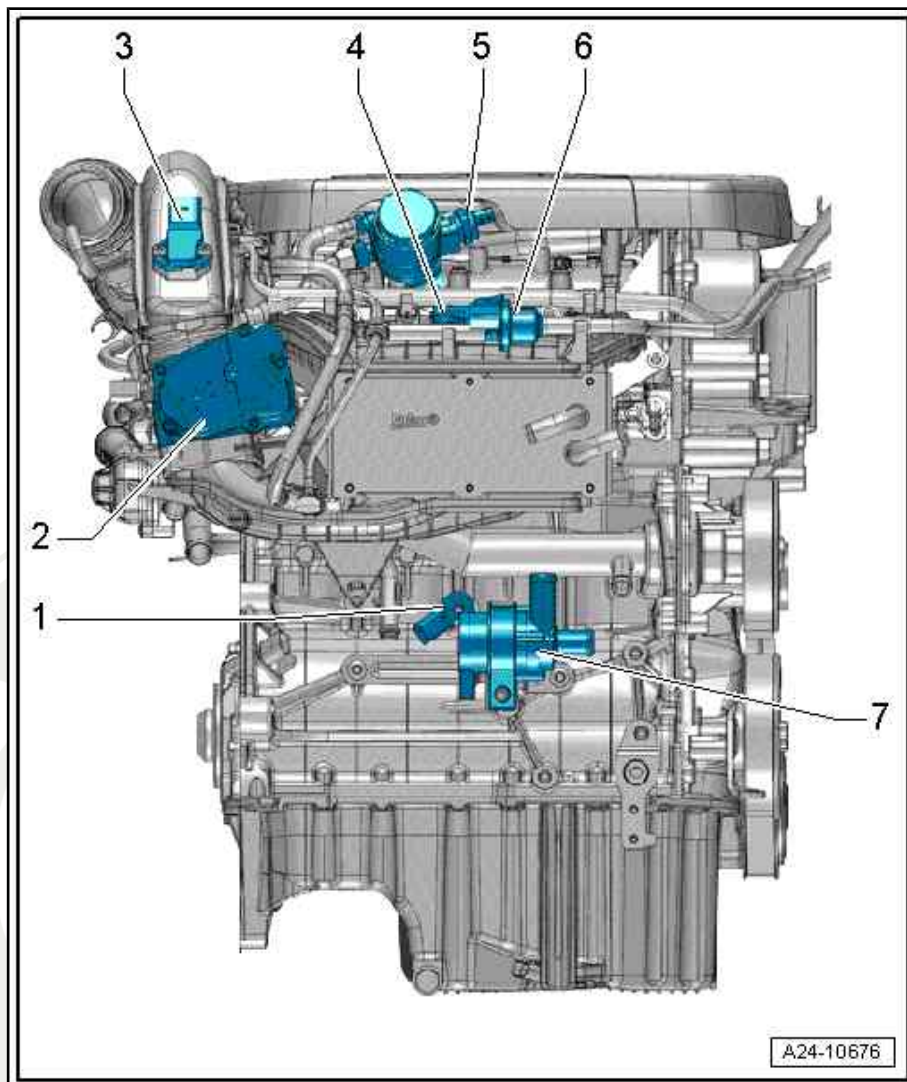
4 - Intake air temperature sender -G42- and intake manifold pressure sender -G71-

5 - Control valve for fuel pressure -N276-

6 - Solenoid valve 1 for activated charcoal filter -N80-

7 - Coolant recirculation pump -V50-

- ❑ removing and installing ➔ [page 107](#)



Engine - gearbox side

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1 - Solenoid valve for charge pressure control -N75 -

- ☐ screwed onto the exhaust turbocharger

2 - Oil pressure switch -F1-

- ☐ check ➔ [page 100](#)

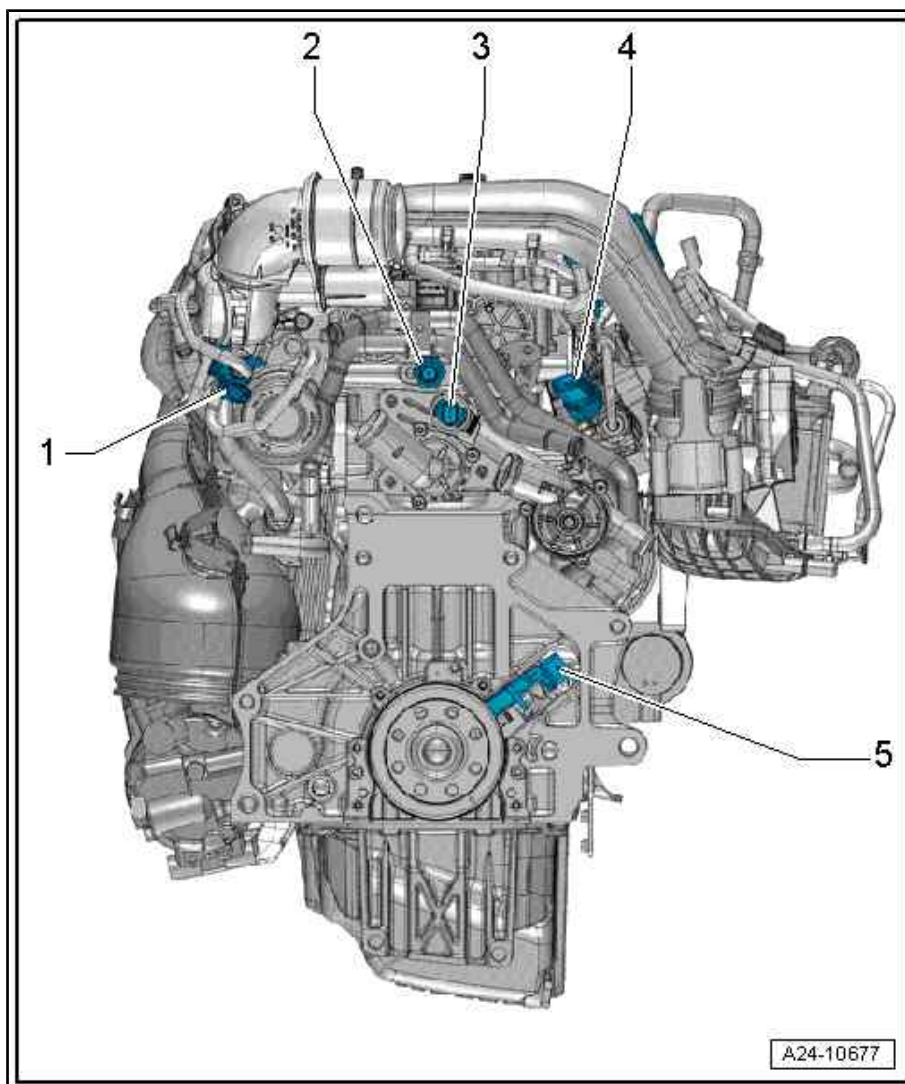
3 - Coolant temperature sender -G62-

4 - Fuel pressure sender -G247-

- ☐ check ➔ [page 187](#)

5 - Engine speed sender -G28-

- ☐ Summary of components ➔ [page 201](#)
- ☐ removing and installing ➔ [page 203](#)



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2 Intake manifold and fuel distributor

2.1 Intake manifold - Summary of components

Part I

1 - Connecting hose

2 - Fuel pipe

- ☐ High-pressure
- ☐ Tightening torques of the union nuts:

at high pressure pump:
18 Nm

at the bottom part of in-
take manifold/fuel distrib-
utor: 20 Nm

3 - 8 Nm

4 - Bushing

5 - Fuel hose

- ☐ Low pressure
- ☐ to high pressure pump

6 - Spring strap clamp

- ☐ use spring strap clips ,
e.g. -VAS 6340- , for re-
moving and installing

7 - Connection fittings

- ☐ for fuel feed

8 - Non-return valve

- ☐ for crankcase ventila-
tion

9 - 8 Nm

10 - O-ring

- ☐ replace

11 - Connection fittings

- ☐ at timing case

12 - Pressure pipe

- ☐ from exhaust turbocharger

13 - Connecting hose

- ☐ at camshaft housing

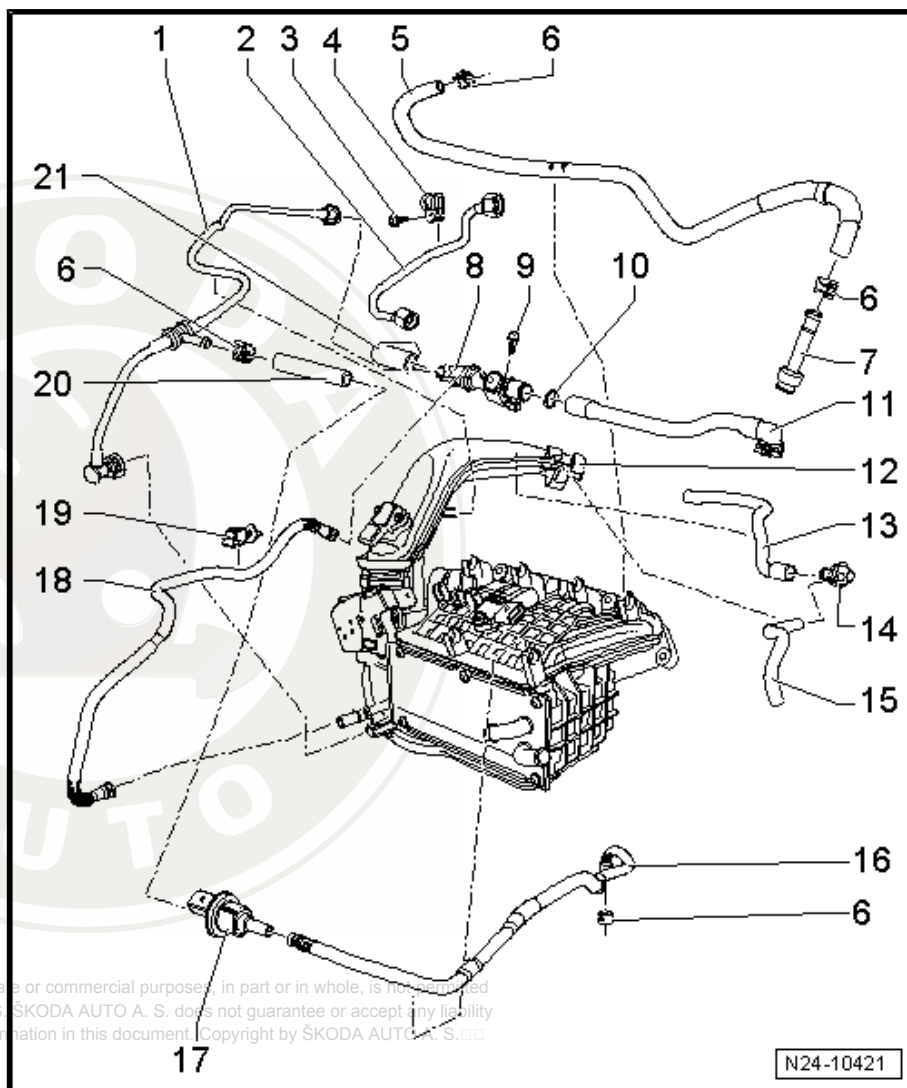
14 - Non-return valve

15 - Connecting hose

- ☐ at air filter housing

16 - Connecting hose

- ☐ at activated charcoal filter



17 - Solenoid valve 1 for activated charcoal filter -N80-

18 - Connecting hose

19 - Bushing

20 - Connecting hose

21 - Connecting hose

☐ at exhaust turbocharger

Part II

1 - Retaining clip

2 - 7 Nm

3 - Pressure pipe

4 - O-ring

☐ replace

5 - Charge pressure sender - G31- with intake air temperature sender 2 -G299-

6 - 5 Nm

7 - 7 Nm

8 - Adapter

9 - Intake manifold

☐ with charge air cooler

☐ removing and installing
⇒ [page 174](#)

10 - Intake manifold pressure sender -G71-

11 - 5 Nm

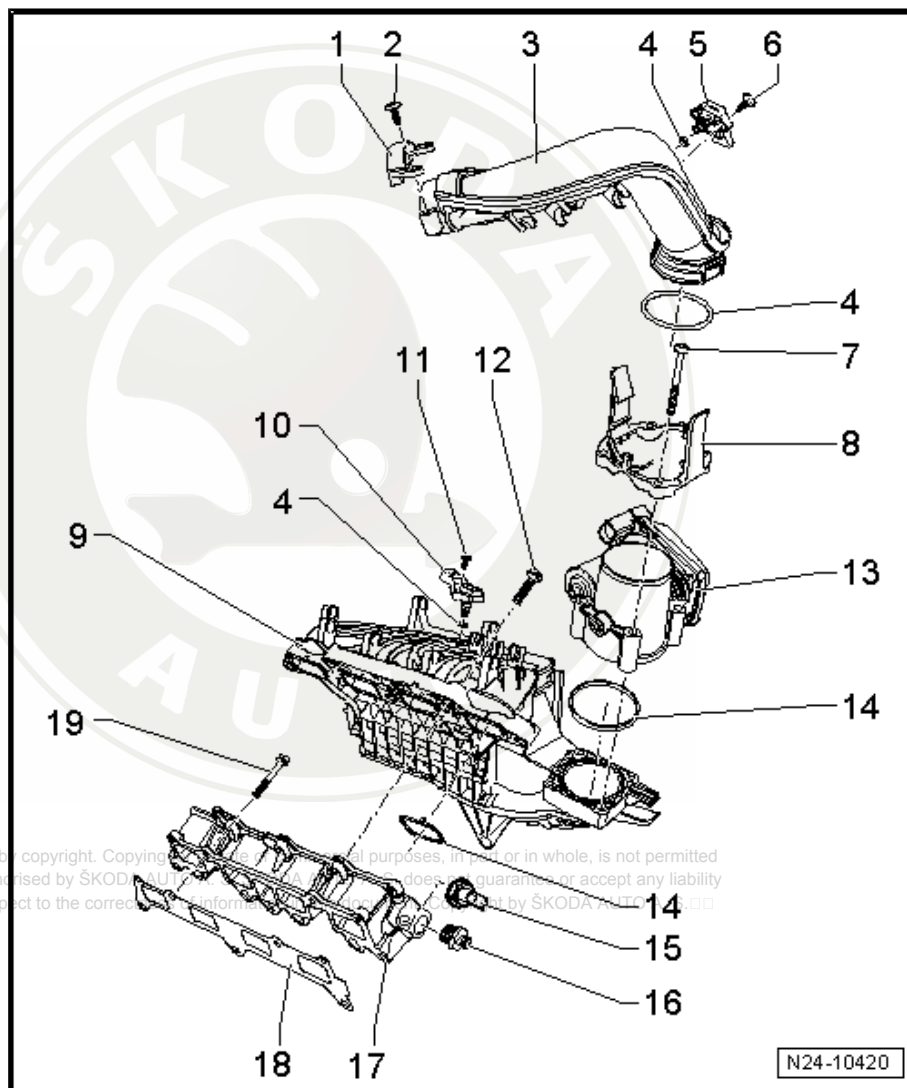
12 - 20 Nm

13 - Throttle valve control unit -J338-

☐ removing and installing
⇒ [page 171](#)

☐ clean ⇒ [page 173](#)

☐ in case of replacement,
erase initialisation values and adapt the engine control unit -J623-
⇒ Vehicle diagnosis,
testing and information
system VAS 5051.



14 - Sealing ring

☐ replace

15 - Fuel pressure sender -G247- , 22 Nm

☐ check ⇒ [page 187](#)

16 - 80 Nm

17 - Bottom part of intake manifold

☐ remove the throttle valve control unit -J338- for removal ⇒ [page 171](#)

☐ Removing and installing intake manifold ⇒ [page 174](#)

18 - Gasket

- ☐ replace

19 - 20 Nm

2.2 Bottom part of intake manifold/fuel distributor with injection valves - Summary of components

1 - O-ring

- ☐ replace
- ☐ before fitting moisten lightly with clean engine oil

2 - Spring element

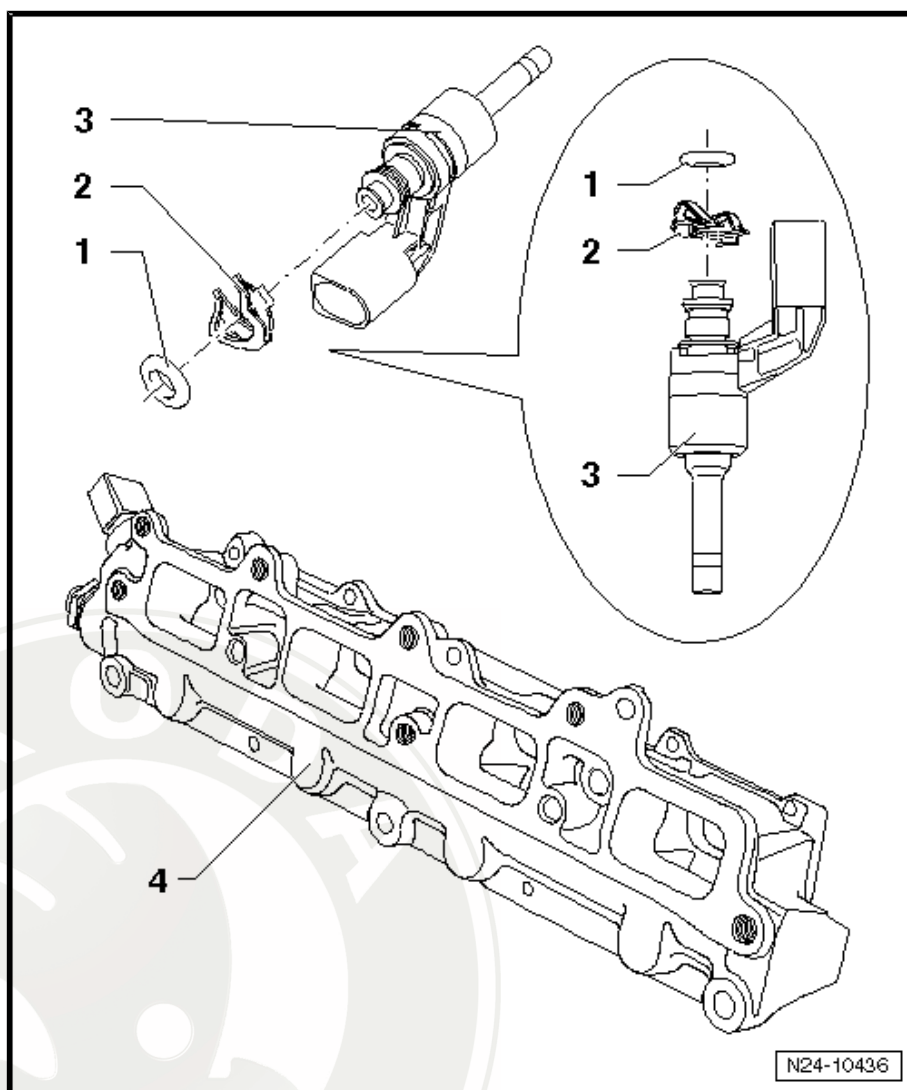
- ☐ replace bottom part of intake manifold/fuel distributor after each removal
- ☐ check for correct seating on injector

3 - Injection valve for cylinder 4 -N33-

- ☐ Injection valve for cylinder 1 -N30-
- ☐ Injection valve for cylinder 2 -N31-
- ☐ Injection valve for cylinder 3 -N32-
- ☐ with Teflon gasket ring and supporting washer
- ☐ after removing the injection valve, the Teflon gasket ring and the supporting washer must be replaced ⇒ [page 183](#)
- ☐ Removing and installing the injection valves ⇒ [page 182](#)

4 - Bottom part of intake manifold

- ☐ remove and install the throttle valve control unit -J338- and the intake manifold for removal ⇒ [page 171](#)



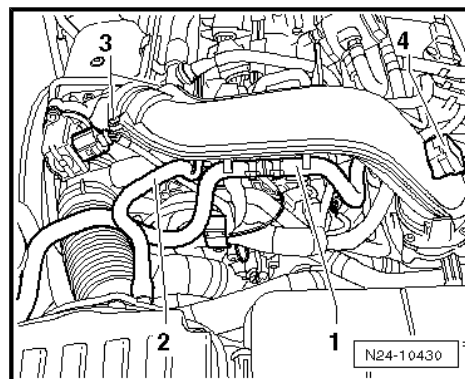
2.3 Removing and installing the throttle valve control unit -J338-

Removing

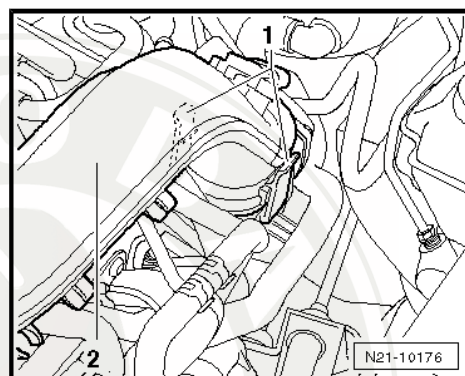
- Remove engine cover ⇒ [page 9](#) .

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- Unhook hoses -1- and -2- at pressure pipe.
- Unplug the plug from the charge pressure sender -G31- with intake air temperature sender 2 -G299 - -4- and release the fixing screws -3-.



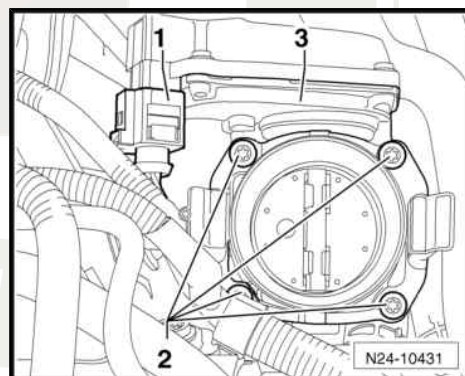
- Press the retaining clips -1- towards the outside and press the pressure pipe -2- slightly towards the top.
- Then pull off the pressure pipe -2- from the exhaust turbo-charger.



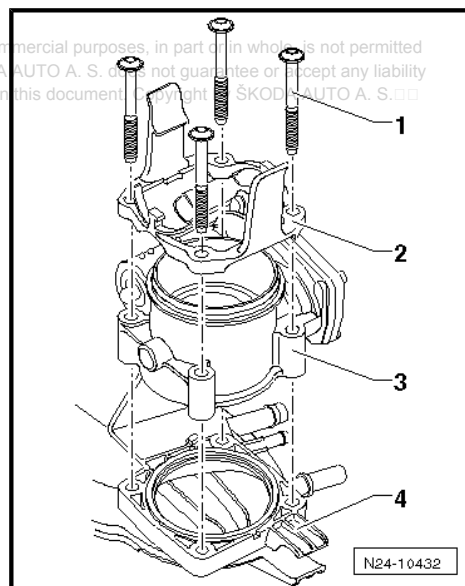
- Disconnect the plug -1- from the throttle valve control unit - J338 - .
- Unscrew the fixing screws -2- and remove the throttle valve control unit -3- from the intake manifold.

Install

- Insert a new gasket ring in the groove of the intake manifold.



- Position the throttle valve control unit -3- together with the adapter -2- and the fixing screws -1- onto the intake manifold -4-.



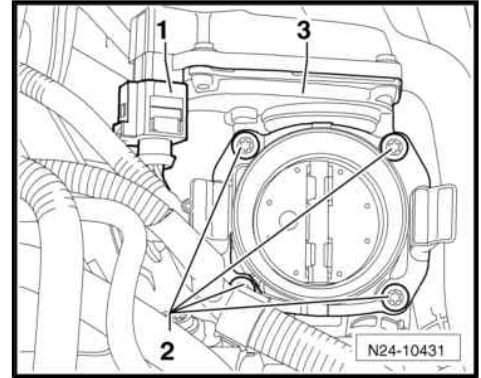


- Tighten fixing screws -2- to 7 Nm.
- Fit the plug -1- at the throttle valve control unit -3-.

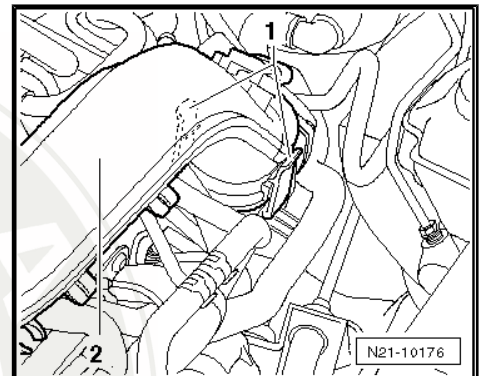


Note

Before fitting the O-rings at the exhaust turbocharger and in the pressure pipe moisten slightly with engine oil.



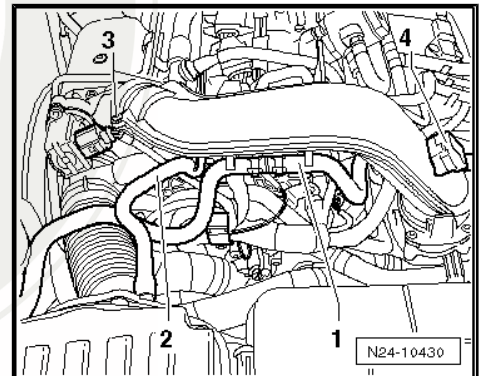
- Fit the pressure pipe -2- at the turbocharger.
- Press the pressure pipe -2- onto the throttle valve control unit.
- During this procedure the retaining clips -1- must click audibly into place.



- Tighten screws -3- of retaining clip to 7 Nm.
- Fit the plug at the charge pressure sender -G31- with intake air temperature sender 2 -G299 - .
- Press the hoses -1- and -2- into the brackets at the pressure pipe.
- Install the engine cover ⇒ [page 9](#) .

If a new throttle valve control unit was installed:

- Erase initialisation values and adapt the engine control unit - J623- to the throttle valve control unit ⇒ Vehicle diagnosis, testing and information system VAS 5051.



2.4 Clean throttle valve control unit -J338-

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Note

- ♦ *If a new engine control unit -J623- is fitted, the throttle valve control unit must be adapted. The adaptation must only be carried out with a new or cleaned throttle valve control unit, because dirt/carbon deposits in the end stop of the throttle valve can lead to incorrect adaptation values.*
- ♦ *The throttle valve support must not be scratched when cleaning.*
- Remove the throttle valve control unit ⇒ [page 171](#) .

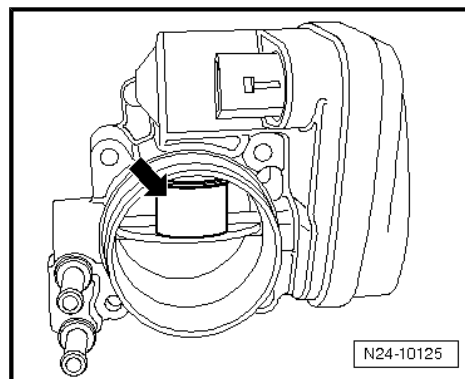
- Open the throttle valve manually and block the throttle valve in the opened position with a suitable object (e.g. plastic or wooden wedge)-arrow-.



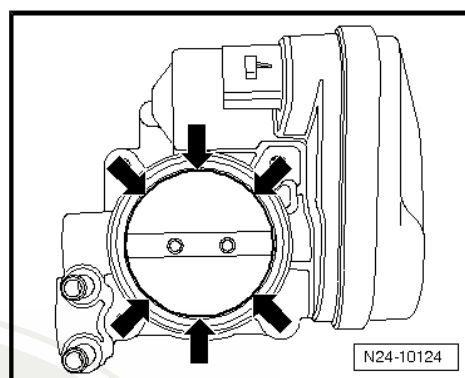
WARNING

Acetone is easily inflammable.

- ◆ *Observe the accident prevention regulations and the safety instructions when handling easily inflammable fluids.*
- ◆ *Do not use compressed air when cleaning the throttle valve.*
- ◆ *Wear safety goggles and safety clothing, in order to avoid injuries and skin contact with fuel.*



- Thoroughly clean the throttle valve support, in particular the area of the closed throttle valve -arrows-, with commercially available acetone and a paint brush.
- Wipe the throttle valve support with a fluffy cloth.
- Let the acetone dry off completely and re-install the cleaned throttle valve control unit.
- Erase initialisation values and adapt the engine control unit - J623- to the throttle valve control unit ⇒ Vehicle diagnosis, testing and information system VAS 5051.



2.5 Removing and installing intake manifold

Special tools and workshop equipment required

- ◆ Pliers for spring strap clamps

Removing



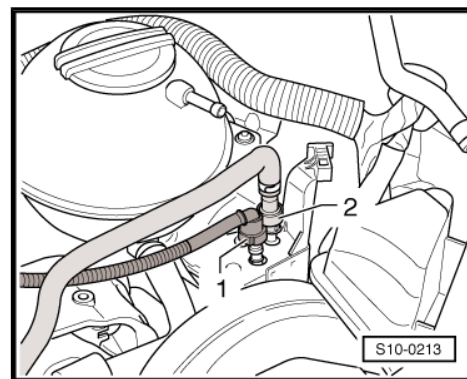
Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.
- Drain the coolant from the charge air cooling system
⇒ [page 103](#).
- Remove the throttle valve control unit ⇒ [page 171](#).

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- Disconnect the feed line -2- (press in the securing ring to the top) and catch the fuel which flows out with a cleaning cloth.

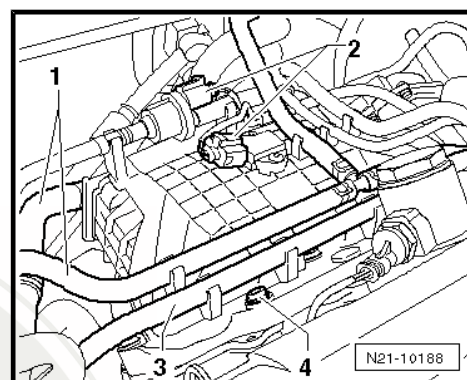


- Remove the coolant hoses -1- and disconnect the plug connections -2-.
- Remove the fuel feed line -3- and unscrew the fixing screws -4- of the intake manifold.

Install

Installation occurs in reverse order to removal.

- ◆ Tightening torque of fixing screws for intake manifold: 20 Nm
- ◆ Tightening torque and tightening sequence for charge-air cooler: ➔ [page 162](#)
- Top up and bleed cooling system ➔ [page 103](#) .



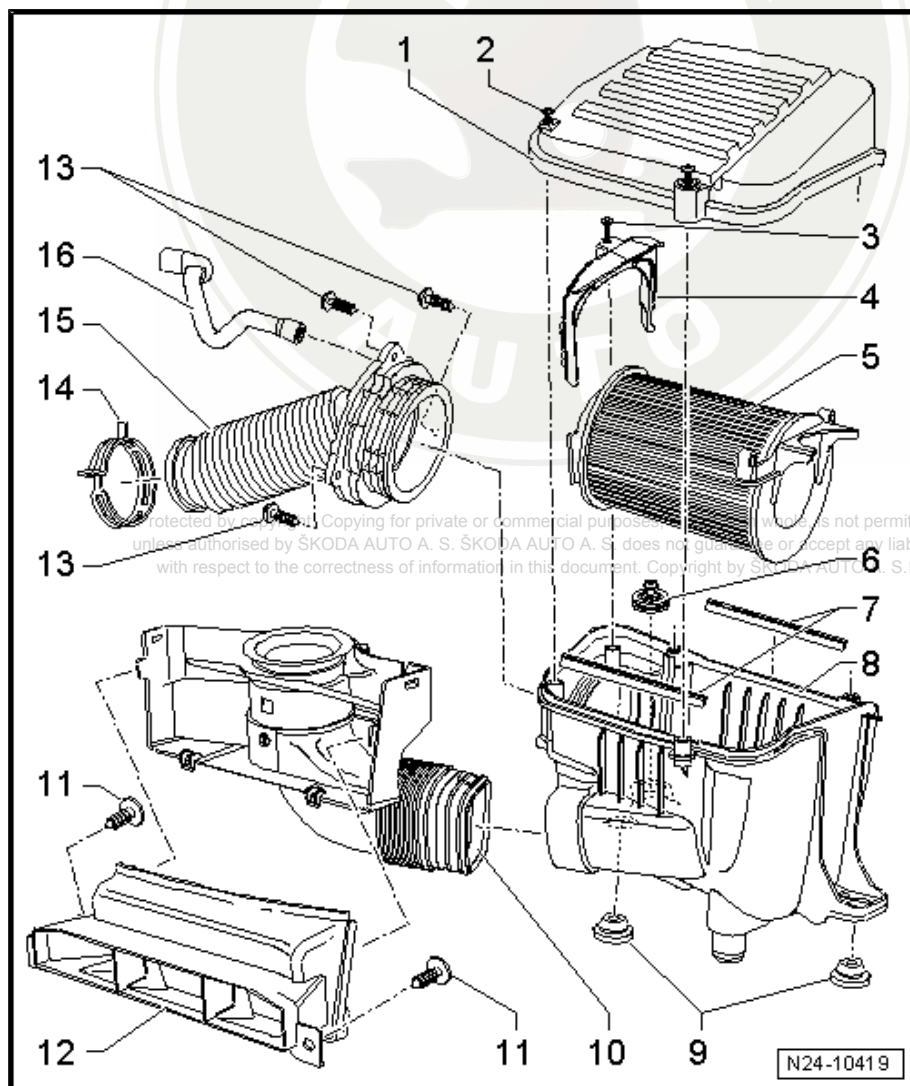
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3 Air filter

3.1 Air filter - Summary of components

Removing and installing air filter ➔ [page 176](#) .

- 1 - Air filter top part
- 2 - 2 Nm
- 3 - 2 Nm
- 4 - Support
- 5 - Filter element
- 6 - Rubber-metal bearing, 8 Nm
 - ☐ with captive screw
- 7 - Seals
 - ☐ replace if damaged
- 8 - Air filter bottom part
 - ☐ removing and installing ➔ [page 176](#)
- 9 - Rubber bearing
- 10 - Inlet connection
 - ☐ with cover
- 11 - 2 Nm
- 12 - Intake air duct
- 13 - 1.6 Nm
- 14 - Spring strap clamp
 - ☐ use spring strap clips , e.g. -VAS 6340- for removing and installing
- 15 - Air intake hose
- 16 - Vacuum hose
 - ☐ replace if damaged
 - ☐ from camshaft housing



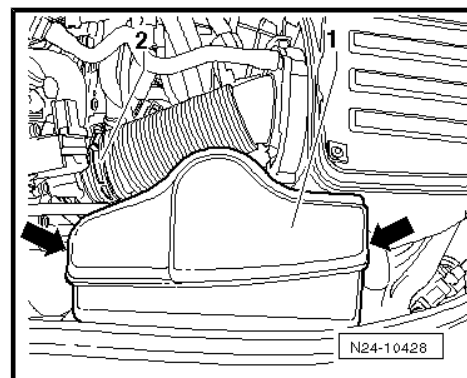
3.2 Removing and installing air filter

Special tools and workshop equipment required

- ◆ Pliers for spring strap clamps

Removing

- Press the catches -arrows- and take the cover -1- from the inlet connection.
- Pull the inlet connection out of the intake air duct.
- Remove the spring strap clamp -2- with the intake hose from the exhaust gas turbocharger.

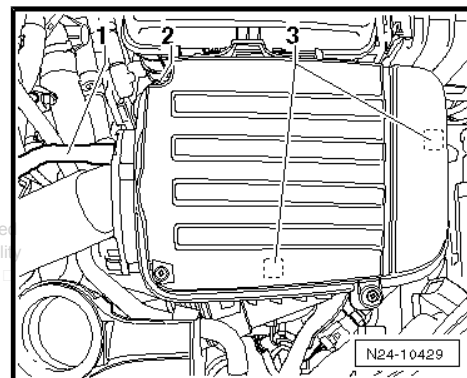
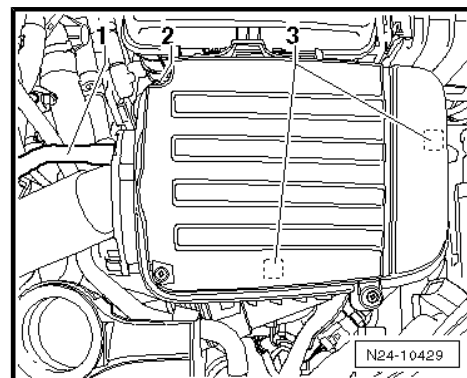


- Detach vacuum hose -1- from air filter housing.
- Unscrew the fixing screw -2- and pull the air filter housing towards the top from the bearing bolts -3-.

Install

Installation is carried out in the reverse order. However, pay attention to the following:

- Press the air filter housing from the top onto the bearing bolts -3-.
- Tighten fixing screw -2- to 8 Nm.
- Fit the vacuum hose -1- at the connection fitting of the air filter housing.



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4 High pressure pump

4.1 High pressure pump - Summary of components



WARNING

The injection system consists of a high pressure part (max. pressure of 12 MPa = 120 bar) and a low pressure part (pressure of approx. 0.6 MPa = 6 bar).

- ◆ *Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced.*
- ◆ *The procedure for this is described in the chapter "release pressure in the high pressure area of the fuel system" ⇒ [page 4](#).*

1 - 15 Nm

2 - Connection fittings

- ☐ Low pressure

3 - Spring strap clamp

- ☐ use spring strap clips, e.g. -VAS 6340- for removing and installing

4 - Fuel hose

- ☐ Low pressure
- ☐ with spring strap clamp

5 - Union nut, 18 Nm

- ☐ hold the connection fitting in the high pressure pump for loosening

6 - Connection fittings

7 - High pressure pump with fuel pressure regulating valve - N276-

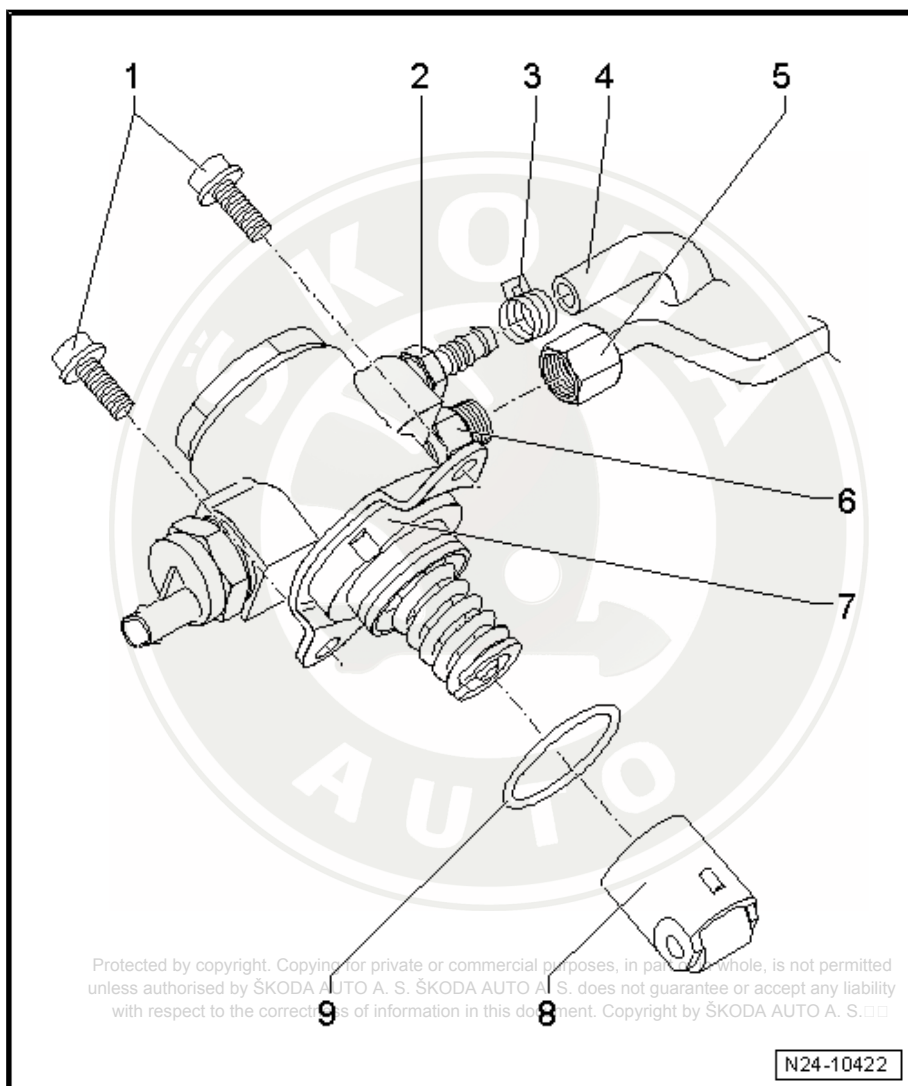
- ☐ removing and installing ⇒ [page 179](#)

8 - Roller tappet

- ☐ before fitting moisten lightly with clean engine oil

9 - O-ring

- ☐ replace
- ☐ before fitting moisten lightly with clean engine oil





4.2 Removing and installing the high pressure pump

Removing



Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.



WARNING

The injection system consists of a high pressure part (max. pressure of 12 MPa = 120 bar) and a low pressure part (pressure of approx. 0.6 MPa = 6 bar).

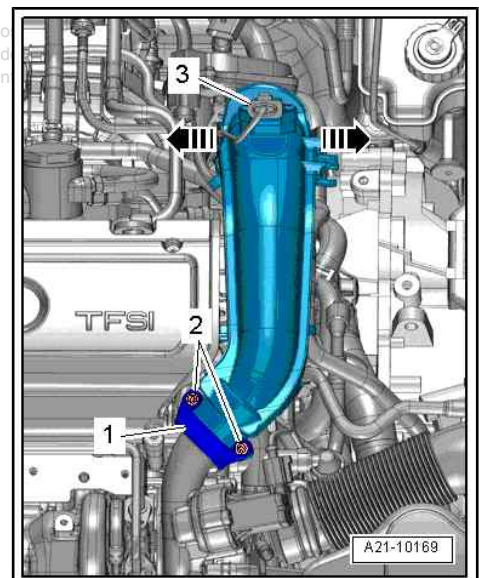
- ◆ *Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced.*
- ◆ *The procedure for this is described in the chapter "release pressure in the high pressure area of the fuel system"*
⇒ [page 4](#).

- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299-.
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.



Note

Hold the screwed connections at the high pressure pump and at the bottom part of intake manifold/fuel distributor when unscrewing the union nuts with a wrench.

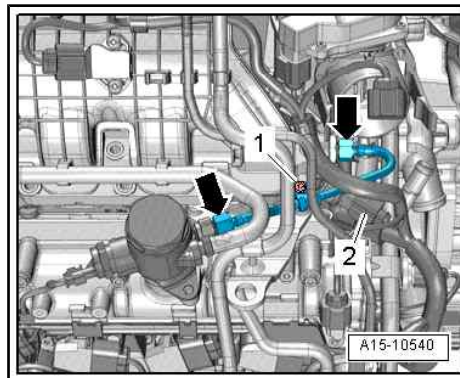


- Unscrew union nuts -arrows- and screw -1- and remove high pressure line.



Note

- ♦ *The bracket for the fuel lines must on no account be bent up.*
- ♦ *If the bracket is bent up or the fuel line is replaced, the bracket must also be replaced.*

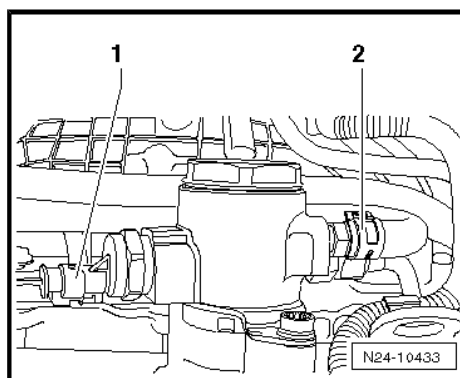


- Disconnect the plug -1- from the fuel pressure regulating valve -N276- and the fuel feed line -2- from the high pressure pump.

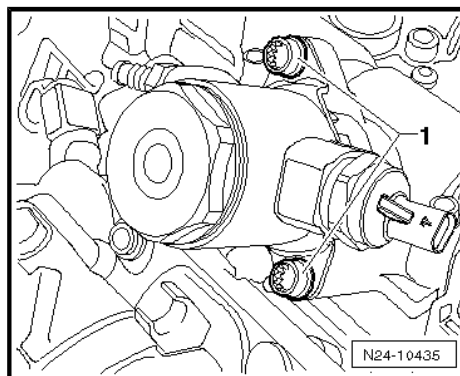


Note

Collect the fuel which flows out with a cloth.



- Screw out the fixing screws -1- evenly.



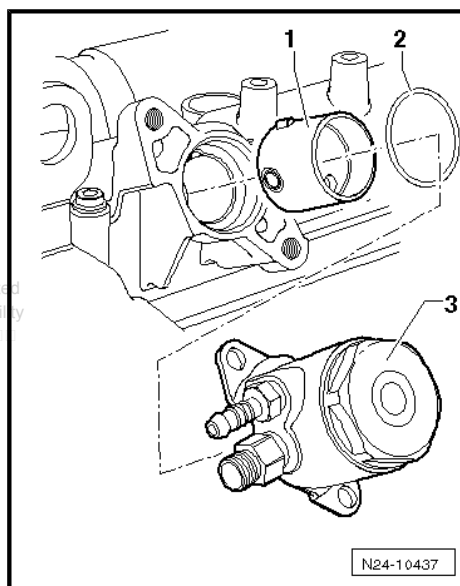
- Pull the high pressure pump -3- and the roller tappet -1- out of the camshaft housing.

Install



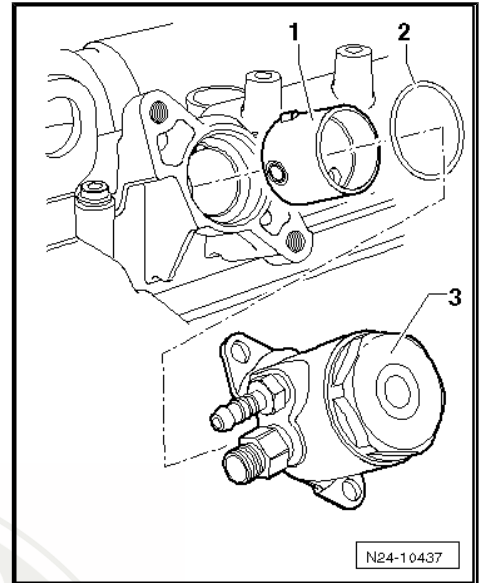
Note

- ♦ *Moisten the roller tappet of the high pressure pump with clean engine oil.*
- ♦ *Always replace the O-ring of the high pressure pump.*

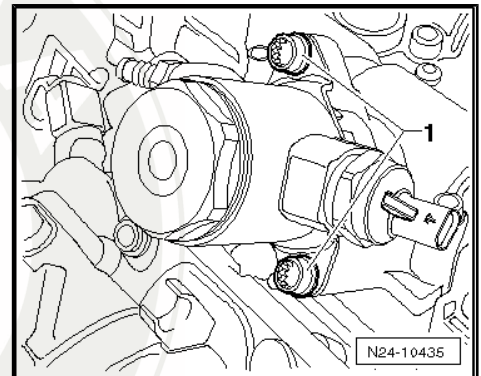




- Slide the roller tappet -1- into the camshaft housing.
- Insert a new, oiled O-ring -2- into the slot of the high pressure pump -3-.
- Turn the crankshaft until the roller tappet is in the lowest position.
- Position the high pressure pump -3- onto the camshaft housing.



- First of all screw in the fixing screws -1- sufficiently until the bolt heads are positioned on the flange.
 - Then tighten the fixing screws -1- evenly.
- Tightening torque: 20 Nm

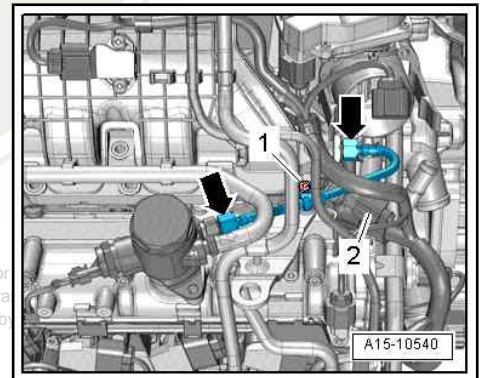


- Screw on the union nuts of the high pressure line -3- by hand.
- Install the bracket for the fuel lines and tighten the fixing screw -1- to 8 Nm.

i Note

Hold the screwed connections at the high pressure pump and at the bottom part of intake manifold/fuel distributor when tightening the union nuts with a wrench.

- Tighten the union nuts of the high pressure line -arrows- to 18 Nm.



Further installation occurs in reverse order.

5 Injection valves

5.1 Removing and installing injection valves

Observe the safety instructions before starting fitting work
⇒ [page 5](#) .



Note

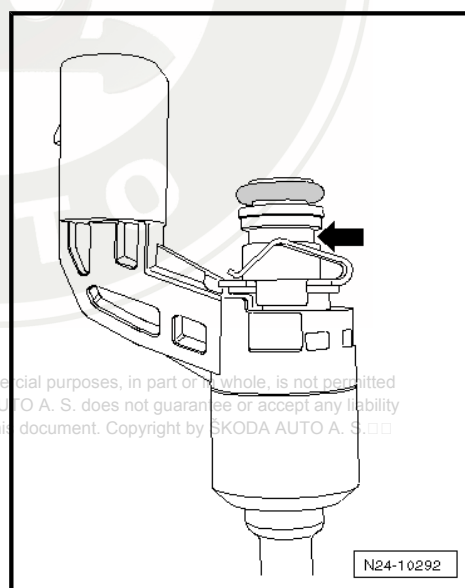
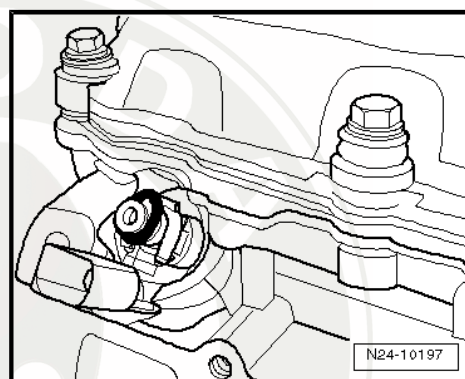
The Teflon gasket ring on the injection valve must be replaced each time after removing the injection valve ⇒ [page 183](#) .

Special tools and workshop equipment required

- ◆ Set of tools -T10133-

Removing

- Removing the intake manifold ⇒ [page 174](#) .
- Remove bottom part of intake manifold/fuel distributor
⇒ [page 169](#) .
- Press the O-ring upwards by hand as shown and remove it from the injection valve.
- Screw the striking hammer -T10133/3 - with the extractor -T10133/15- .
- Then insert the extractor -T10133/15- into the groove -arrow- on the injection valve.

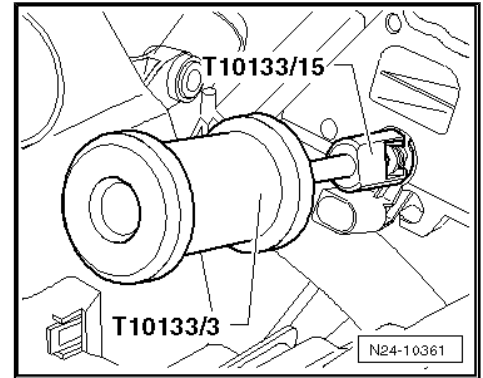


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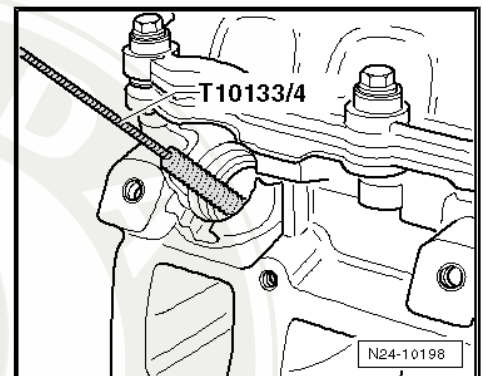


- Pull out the injection valve with careful knocks.

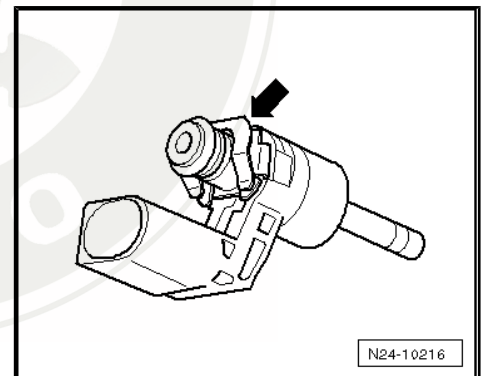
Install



- Thoroughly clean the holes of the injection valves in the cylinder head with the nylon brush -T10133/4- .
- Check the supporting washer made of plastic for damage, replace if necessary ⇒ [page 183](#) .



- Replace the spring element -arrow- as well as the Teflon gasket ring each time after removing the injection valves ⇒ [page 183](#) .
- Replace O-rings between injection valve and bottom part of the intake manifold/fuel distributor and moisten lightly with clean engine oil.



Note

The Teflon gasket ring of the injection valve must neither be oiled nor greased.

- Press the injection valve by hand up to the stop into the hole of the cylinder head.



Note

The injection valve must insert easily, if necessary wait until the gasket ring has been drawn together sufficiently.

- Pay attention to the correct seating and fitting position of the injection valves in the cylinder head.
- Carefully position the bottom part of the intake manifold/fuel distributor onto the injection valves and tighten the fixing screws to 20 Nm.
- Installing the intake manifold ⇒ [page 174](#) .

5.2 Replace Teflon gasket ring and supporting washer at injection valve

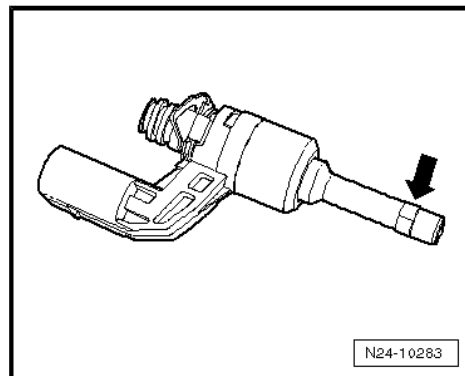
Special tools and workshop equipment required

- ◆ Set of tools -T10133-

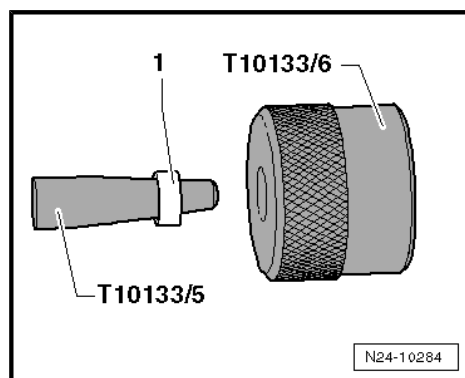
Work procedure

Replace Teflon gasket ring

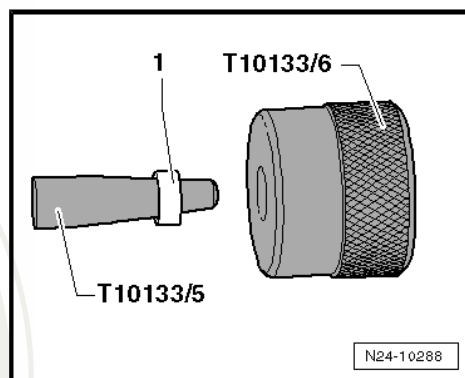
- Remove injection valves ➔ [page 182](#) .
- Carefully clean the injection valve.
- Carefully cut open the gasket ring with a knife as shown -arrow-. Absolutely try to avoid the contact of the knife blade with the valve body.
- Remove the old gasket ring and clean the gasket ring nut in the area of the gasket ring -arrow-. Remove the existing deposits (carbon deposits) with a wire brush.



- Fit a new gasket ring -1- onto the assembly cone -T10133/5-. Slightly push the gasket ring with the assembly sleeve -T10133/6- (knurling points to the gasket ring -1-) as far as possible onto the assembly cone -T10133/5- .

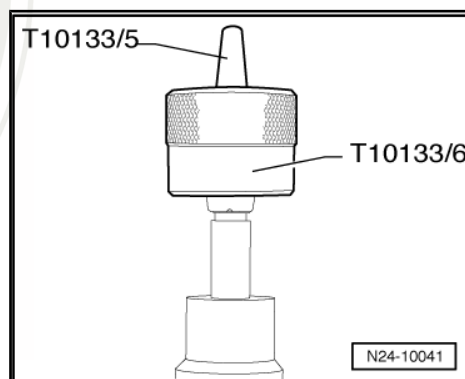


- Turn the assembly sleeve -T10133/6- around (now the knurling points away from the gasket ring), and push the gasket ring -1- up to the end onto the assembly cone -T10133/5- .
- Now position the assembly cone -T10133/5- with the gasket ring from the front onto the injection valve. Push the gasket ring with the assembly sleeve -T10133/6- further onto the injection valve.

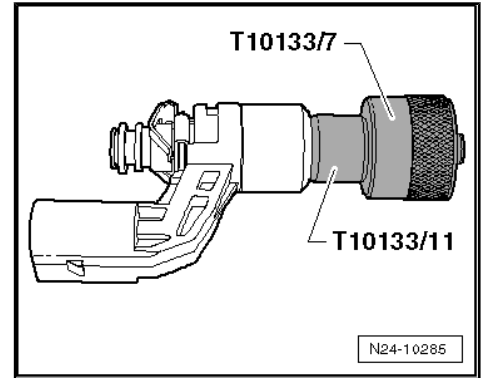


The gasket ring is not yet seated in its groove.

- Remove the assembly sleeve -T10133/6- and the assembly cone -T10133/5- .
- Push the gasket ring by hand into the annular groove.
- Fit the spacer sleeve -T10133/11- onto the valve body.



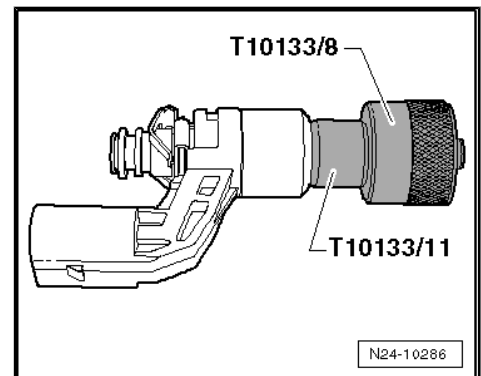
- Now press the calibration sleeve - T10133/7- via the gasket ring up to the stop at the spacer sleeve -T10133/11- .
- Pull off again the calibration sleeve -T10133/7- .



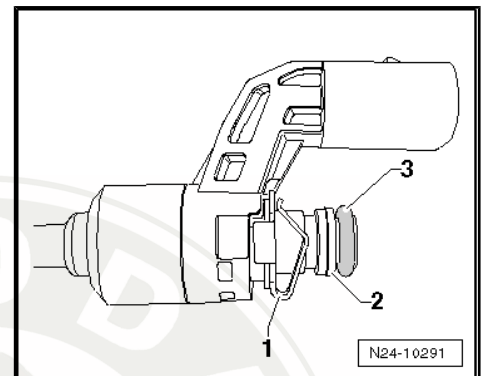
- Now press the calibration sleeve - T10133/8- via the gasket ring up to the stop at the spacer sleeve -T10133/11- .
- Pull off again the calibration sleeve -T10133/8- .

Now the Teflon gasket ring has its correct fitting dimension.

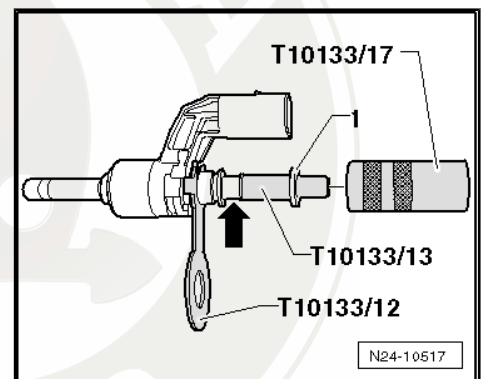
Replace supporting washer



- Remove O-ring -3-.
- Cut open the supporting washer -2- with a small side cutter and take it off.
- Pull off the spring element at the injection valve -1- and instead push on the lock washer -T10133/12 - .

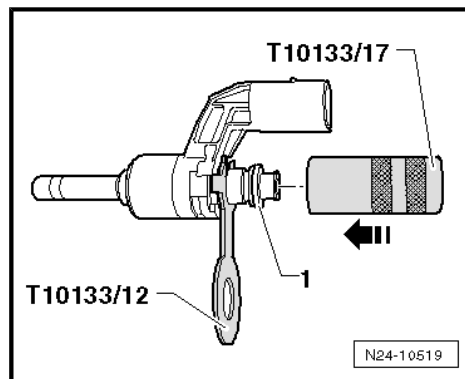


- Mount a new supporting washer -1- on the assembly cone - T10133/13- and fit it onto the injection valve as shown.
- Push the supporting washer -1- with the calibration sleeve - T10133/17- (knurled side points to the injection valve) up to the first nut -arrow- onto the injection valve.

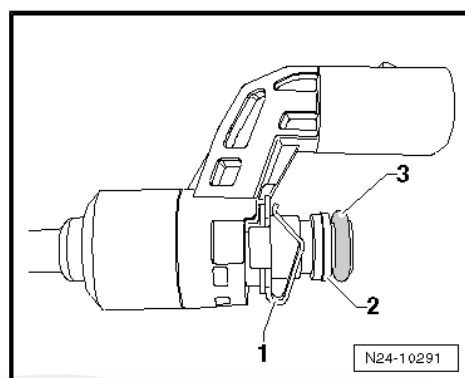


- Now turn the calibration sleeve -T10133/17- around (knurled side points away from the injection valve). Push the calibration sleeve via the supporting washer -1- in -direction of arrow- up to the stop on the lock washer -T10133/12- .
- Pull off again the calibration sleeve -T10133/17- .

Now the supporting washer has its correct fitting dimension.



- Now fit a new spring element -1- for the lock washer -T10133/12- and push a new O-ring -3- in front of the supporting washer -2-.

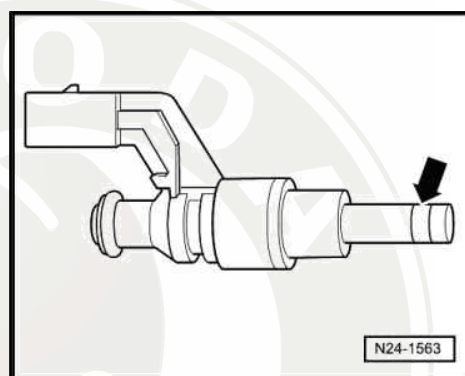


Note

The Teflon gasket ring -arrow- must not be oiled when installing the injection valve.

- Install injection valves ⇒ [page 182](#) .
- Carefully position the bottom part of the intake manifold/fuel distributor onto the injection valves and tighten the fixing screws to 20 Nm.
- Installing the intake manifold ⇒ [page 174](#) .

Further installation occurs in reverse order to removal.



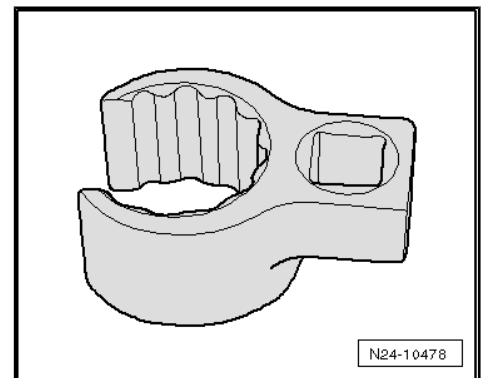
6 Testing components

6.1 Check fuel pressure sender -G247-

If the fuel pressure sender -G247- fails, the fuel pressure regulating valve -N276- is deactivated, the electric fuel pump is fully actuated and the pressure in the fuel distributor is adapted to the pressure in the fuel low pressure area. This results in poor mixture formation, torque reduction and irregular engine running.

Special tools and workshop equipment required

- ◆ Assembly device -T10118-
- ◆ Open ring spanner with 3/8" drive, wrench size 27 mm



- ◆ Pressure sensor tester , e.g. -VAS 6394- (includes digital manometer -VAS 6394/1-)
- ◆ Adapter , e.g. -VAS 6394/2-
- ◆ Test adapter , e.g. -VAS 5570-
- ◆ Vehicle Diagnosis, Measurement and Information System - VAS 505X-



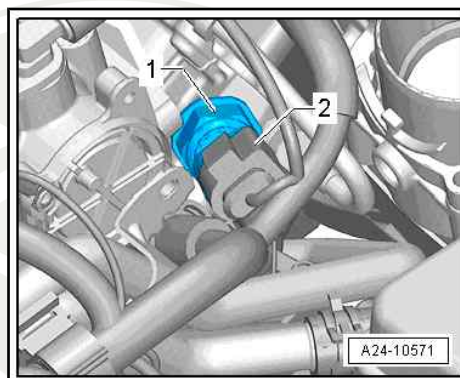
WARNING

The injection system consists of a high pressure part (max. pressure of 12 MPa = 120 bar) and a low pressure part (pressure of approx. 0.6 MPa = 6 bar).

- ◆ *Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced.*
- ◆ *The procedure for this is described in the chapter "release pressure in the high pressure area of the fuel system" [⇒ page 4](#).*

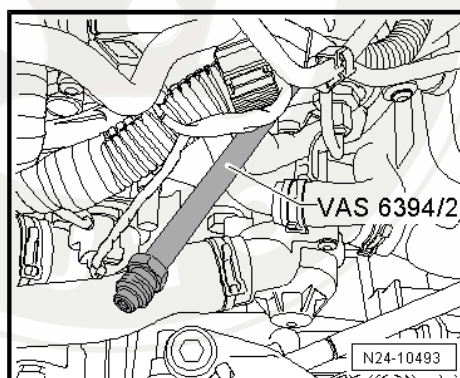
Work procedure

- Remove fuel pressure sender -G247- -1- ➔ [page 189](#)



- Moisten the sealing cone of the adapter -VAS 6294/2- with clean engine oil and screw it into the fuel distributor.

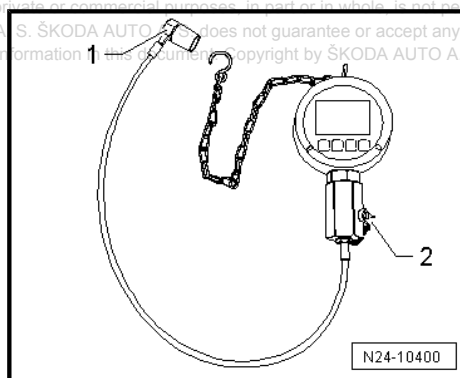
Tightening torque: 22 Nm



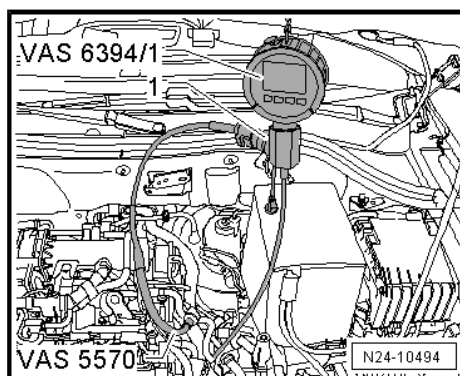
- Release the screw plug -2- and screw the fuel pressure sender -G247- into the tester -VAS 6394/1- .

Tightening torque: 22 Nm

- Screw the pressure line -1- of the digital manometer -VAS 6394/1- by hand onto the adapter -VAS 6294/2- .



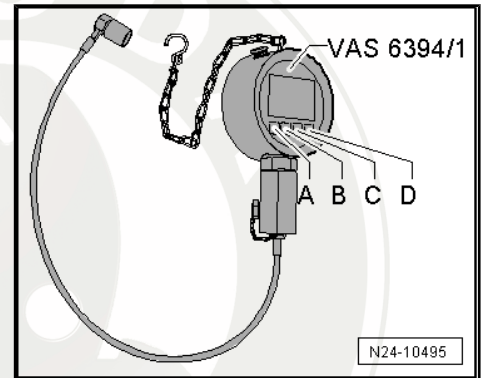
- Connect the test adapter -VAS 5570- to the fuel pressure sender -G247- -1- and to the plug.



- Switch on the tester -VAS 6394/1 - , for this step, briefly press the button -A- once.

i Note

- ◆ If the button -A- is pressed for 2 seconds, the illumination is switched on for 20 seconds.
- ◆ If the tester -VAS 6394/1- does not indicate 0 MPa (0 bar), carry out a zero point of the balance by means of the ⇒ operating instructions .



- Connect the vehicle diagnosis, measurement and information system -VAS 505X- -1- to the diagnostic connection.
- Switch on ignition.
- On the display press consecutively the following buttons:

Vehicle self-diagnosis

Self-diagnosis [?]

01 - Engine Electronics [?]

011 - Measured values [?]

- Select measured value block [1] [4] [0] and confirm with [Q].

The actual value which is transmitted to the vehicle by the fuel pressure sender -G247- is shown in the display field 3.

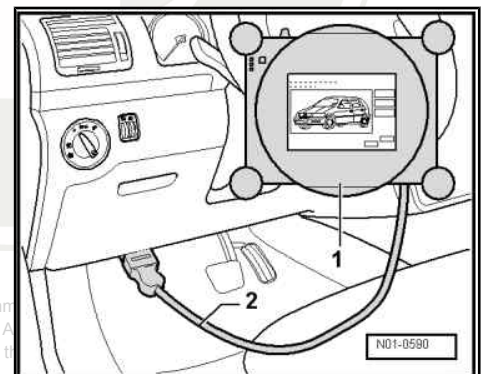
- Start engine.
- Compare the displayed pressure on the digital manometer -VAS 6394/1- with the actual value on the vehicle diagnosis, measurement and information system -505X- .
- The pressures may deviate maximum 0.5 MPa (5 bar) from one another.

If the deviation is greater than 0.5 MPa (5 bar):

- Perform a vehicle diagnosis, measurement and information system -VAS 5051- of the guided function “remove high fuel pressure”.
- Replace fuel pressure sender -G247- .
- Repeat the test with the new fuel pressure sender -G247- and compare both measured values.

If the measured values do not correspond again:

- Perform a cable testing ⇒ Vehicle diagnosis, testing and information system VAS 5051.



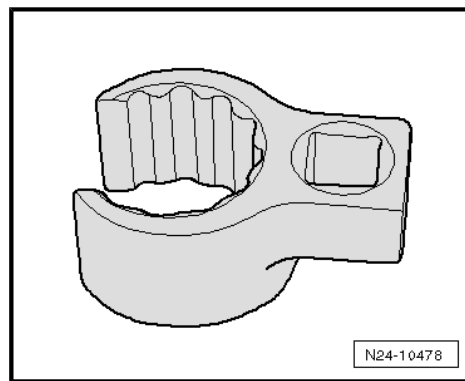
6.2 Removing and installing fuel pressure sender -G247-

Special tools and workshop equipment required

- ◆ Assembly device -T10118-



- ◆ Open ring spanner with 3/8" drive, wrench size 27 mm



Removing



Note

- ◆ *Safety precautions when working on the fuel supply system*
⇒ [page 3](#).
- ◆ *Rules of cleanliness when working on the fuel supply system*
⇒ [page 5](#).
- Switch off the ignition and all electrical components and take out the ignition key.



WARNING

The injection system consists of a high pressure part (max. pressure of 12 MPa = 120 bar) and a low pressure part (pressure of approx. 0.6 MPa = 6 bar).

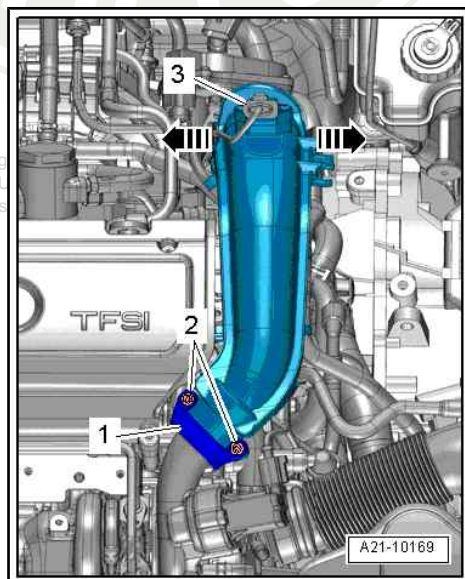
- ◆ *Before opening the high pressure area, e.g. removing the high pressure pump, the fuel distributor, the injection valves, the fuel pipes or the fuel pressure sender -G247-, the fuel pressure in the high pressure area with a remaining pressure of approx. 0.6 MPa (6 bar) must be reduced.*
- ◆ *The procedure for this is described in the chapter "release pressure in the high pressure area of the fuel system"*
⇒ [page 4](#).

- Release screws -2- and remove retaining clip -1-.
- Disconnect plug -3- from charge pressure sender -G31- with intake air temperature sender 2 -G299-.
- Unhook the hoses at the pressure pipe and open the cable guide.
- Press the retaining clips -arrows- towards the outside and pull the pressure pipe out towards the top.
- Then pull off the pressure pipe from the exhaust turbocharger.



Note

Hold the screwed connections at the high pressure pump and at the bottom part of intake manifold/fuel distributor when unscrewing the union nuts with a wrench.





- Unscrew union nuts -arrows- and screw -1- and remove high pressure line.



Note

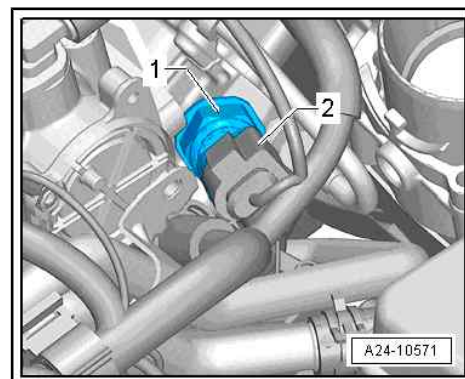
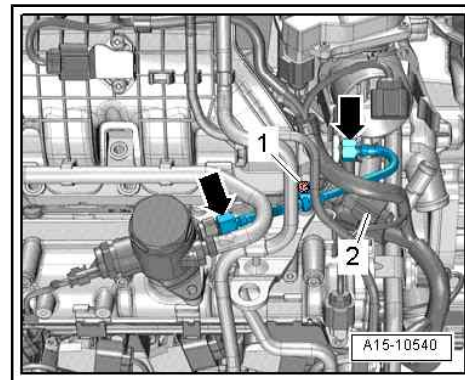
- ◆ *The bracket for the fuel lines must on no account be bent up.*
- ◆ *If the bracket is bent up or the fuel line is replaced, the bracket must also be replaced.*

- Release the plug from the fuel pressure sender -G247- -2- with the assembly tool -T10118 - .
- Screw out fuel pressure sender -G247- with open ring spanner with 3/8" drive, wrench size 27 mm .
- Collect the fuel which flows out with a cleaning cloth.

Install

Installation is carried out in the reverse order. However, pay attention to the following:

- ◆ Tightening torques: ⇒ [page 169](#)



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7 Engine control unit

7.1 Removing and installing engine control unit

Special tools and workshop equipment required

- ◆ Body saw, e.g. -V.A.G 1523 A-



Note

- ◆ *In order to be able to unplug the plugs from the control unit, the control unit must always be removed.*
- ◆ *If the engine control unit is replaced, the vehicle diagnosis, measurement and information system - VAS 5051- must be connected and the function "replace engine control unit" must be carried out.*

Removing

- Switch off ignition.
- Remove the cooling water tank cover ⇒ Body Work; Rep. Gr. 66 .
- Remove bulkhead plenum chamber.
- Removing windscreen wiper and washer system ⇒ Electrical System; Rep. Gr. 92 .

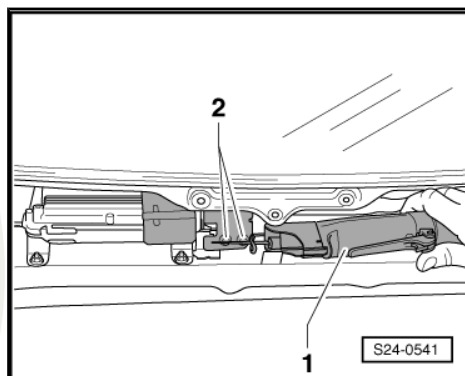
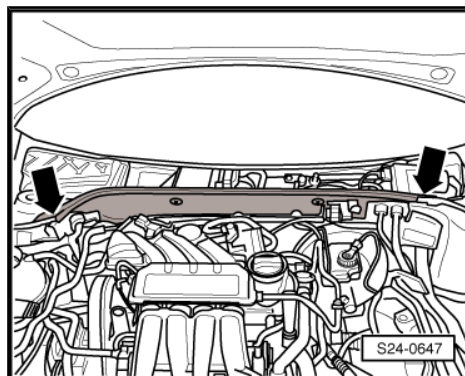
Vehicles with protective cover for plug connections

- Cut with body saw -1- a slot for the cross-head screwdriver in the heads of the pull-off screws -2-.



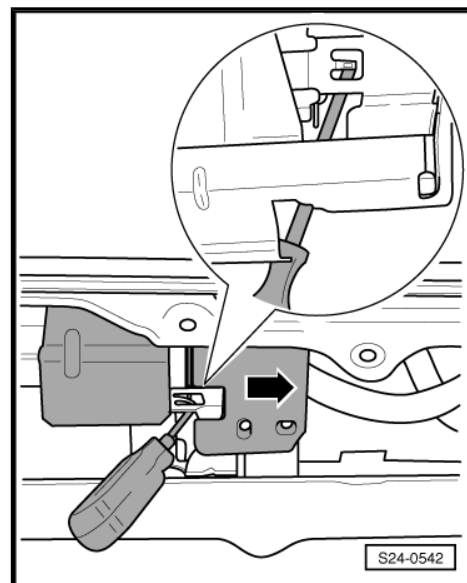
Note

- ◆ *It must be sawed twice with the body saw, so that the slot is wide enough, in order to be able to unscrew the screws with a suitable screwdriver.*
- ◆ *The pull-off screws until are inserted with locking agent.*
- Screw out the screws.



- Lift locking tab of protective cover with a cross-head screw-driver.
- Push the protective cover in the -direction of the arrow- out of the bracket for engine control unit.

Continued for all vehicles



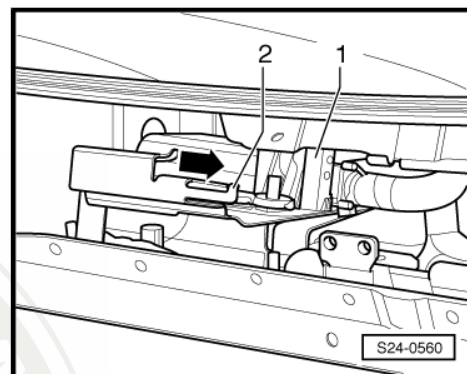
- Lever off fuse -2- slightly.
- Push engine control unit out of the bracket -arrow-.
- Disconnect both plugs at engine control unit and unplug.

Install



Note

For vehicles with protective cover, the metal swarfs must be suctioned out of the plenum chamber before installing the engine control unit.



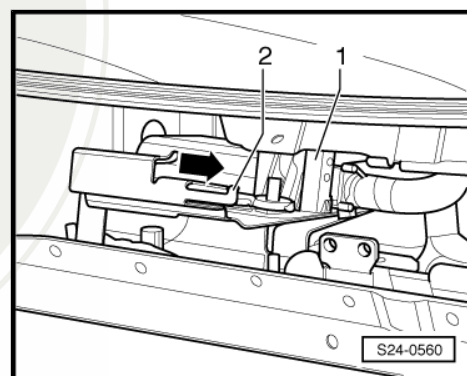
- Connect both plugs and lock.
- Slide the engine control unit onto the retaining bracket.
- Press fuse -2- in direction of engine control unit.

Vehicles with protective cover for plug connections

- Fasten protective cover with new pull-off screws.
- Tighten pull-off screws evenly until the screw heads are pulled off.

Continued for all vehicles

- Installing windscreen wiper and washer system ⇒ Electrical System; Rep. Gr. 92 .
- Install bulkhead plenum chamber and plenum chamber cover ⇒ Body Work; Rep. Gr. 66 .



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26 – Exhaust System

1 Removing and installing parts of the exhaust system

1.1 Catalytic converter and component parts - Summary of components

1 - 8 Nm

- ☐ first of all screw in all fixing screws by hand when installing

2 - Gasket

- ☐ replace

3 - Intermediate pipe

4 - Clamping sleeve, 23 Nm

- ☐ Tighten bolted connections evenly

5 - 23 Nm

- ☐ replace
- ☐ Coat stud bolts of exhaust pipe with hot bolt paste -G 052 112 A3-

6 - Lambda probe downstream of catalytic converter -G130-, 50 Nm

- ☐ the thread of new lambda probes must be coated with assembly paste
- ☐ for re-used lambda probe, only coat the thread with hot bolt paste -G 052 112 A3- ; the paste must not get into the slots of the probe body

7 - Hanger

8 - 23 Nm

9 - Exhaust pipe

- ☐ with decoupling element
- ☐ do not twist decoupling element more than 10° - risk of damage

10 - 23 Nm

- ☐ replace

11 - Exhaust gas turbocharger

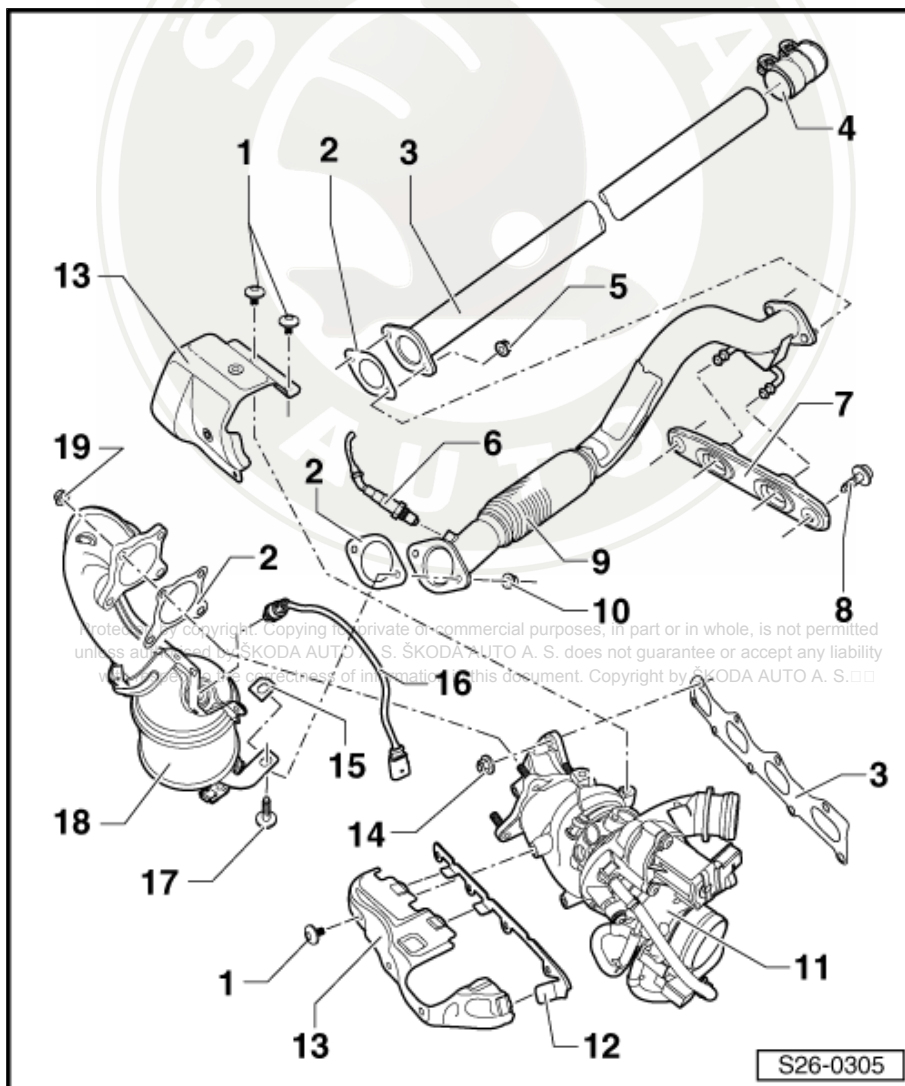
- ☐ The exhaust gas turbocharger and the exhaust manifold can only be replaced together

12 - Support

13 - Heat shield

14 - 16 Nm

- ☐ replace
- ☐ Coat stud bolts of exhaust manifold with hot bolt paste -G 052 112 A3-





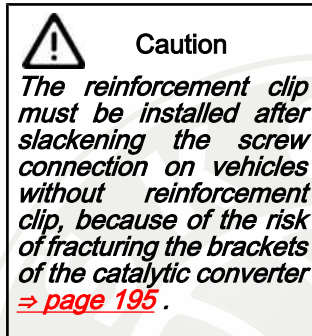
15 - Reinforcement clip

- ☐ Assembly ➔ [page 195](#)

16 - Lambda probe -G39- , 50 Nm

- ☐ the thread of new lambda probes must be coated with assembly paste
- ☐ for re-used lambda probe, only coat the thread with hot bolt paste -G 052 112 A3- ; the paste must not get into the slots of the probe body

17 - 23 Nm



18 - Catalytic converter with exhaust pipe

- ☐ removing and installing ➔ [page 196](#)

19 - 23 Nm

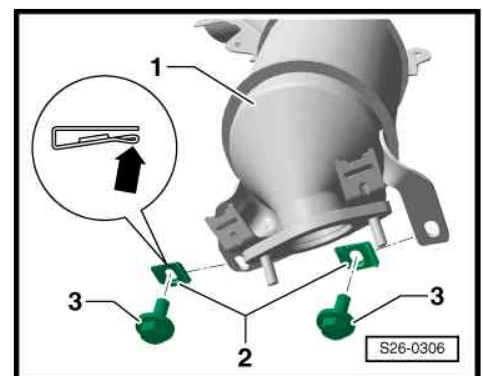
- ☐ replace
- ☐ Coat stud bolts of exhaust gas turbocharger with hot bolt paste -G 052 112 A3-

Assembly - reinforcement clip

- Push the reinforcement clip -2- -as shown in the illustration- onto the brackets of the catalytic converter -1-.
- The “angle of bend” -arrow- must point downwards.

Use new screws -3- with a larger contact surface ➔ Electronic catalogue of original parts .

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1.2 Middle or rear part of the exhaust system - Summary of components

1 - Hanger

2 - 23 Nm

3 - Middle part of exhaust system

- ☐ for first equipment building unit with rear part, replace individually when carrying out repairs
- ☐ replace ➔ [page 198](#)

4 - Retaining strap

- ☐ replace if damaged

5 - Rear clamping sleeve

- ☐ to connect the middle and rear part of the exhaust system
- ☐ Fitting position ➔ [page 198](#)
- ☐ Tighten bolted connections evenly

6 - Front tunnel bridge

7 - 20 Nm

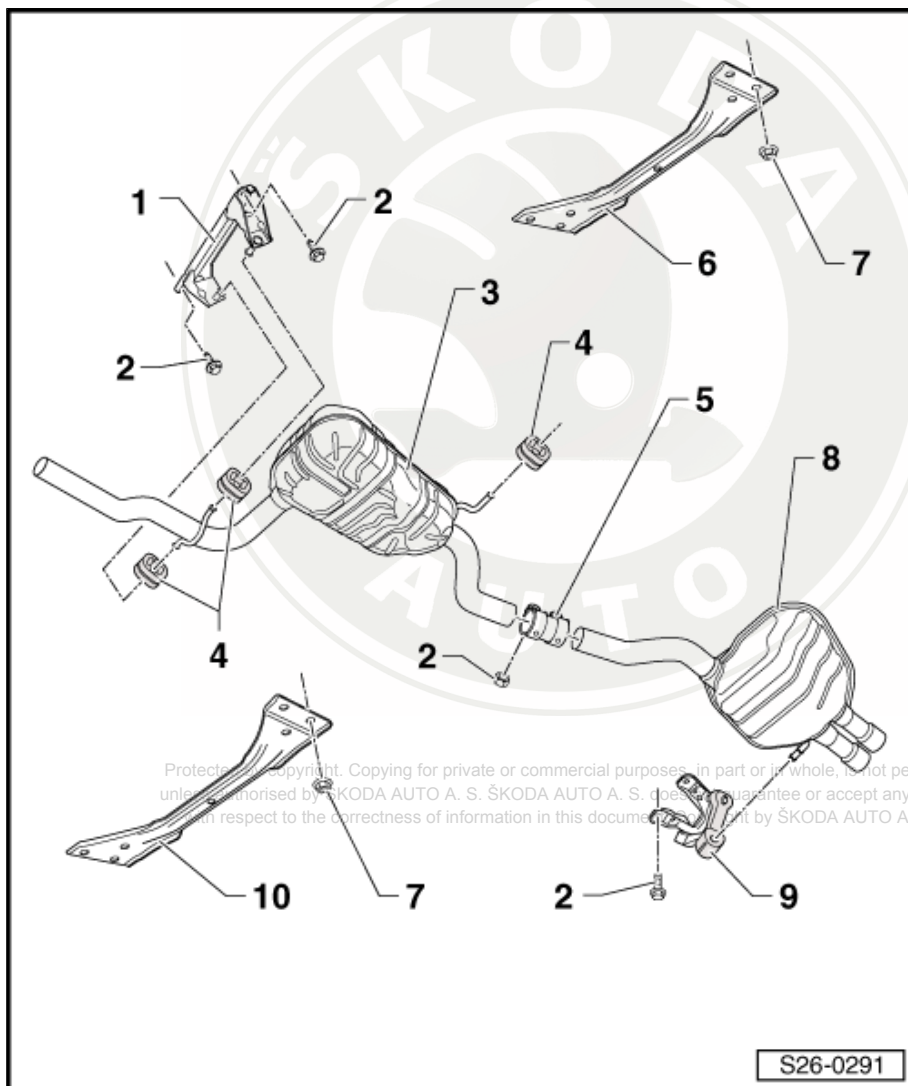
8 - Rear part of exhaust system

- ☐ for first equipment building unit with middle part, replace individually when carrying out repairs
- ☐ replace ➔ [page 198](#)

9 - Retaining strap

- ☐ replace if damaged

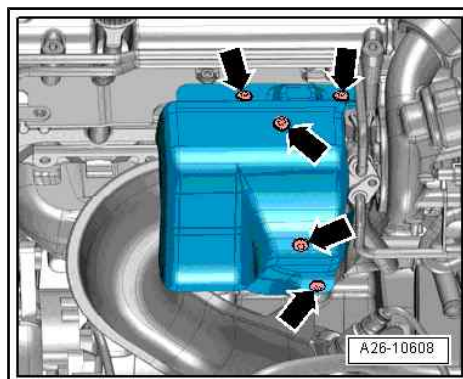
10 - Rear tunnel bridge



1.3 Removing and installing catalytic converter

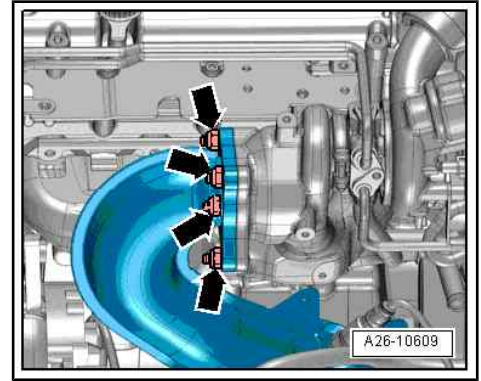
Removing

- Release screws -arrows- and remove heat shield for exhaust turbocharger.





- Release nuts -arrows- for catalytic converter.
- Expose electrical wiring loom to generator at catalytic converter.
- remove ribbed V-belt ⇒ [page 27](#)



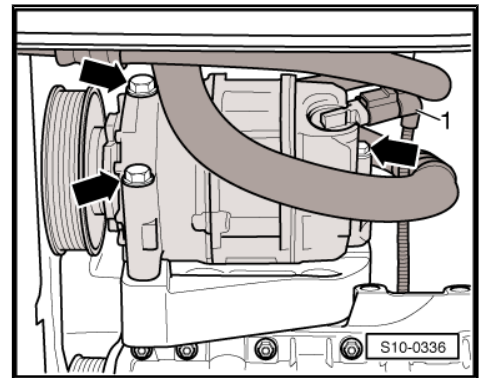
- Disconnect plug -1- for regulating valve at AC compressor.



Note

Do not open the refrigerant circuit of the air conditioning system.

- Release screws -arrows- for AC compressor.



Note

- ◆ *Risk of damaging refrigerant lines and hoses.*
- ◆ *Do not over-tension, buckle or bend refrigerant lines and hoses.*

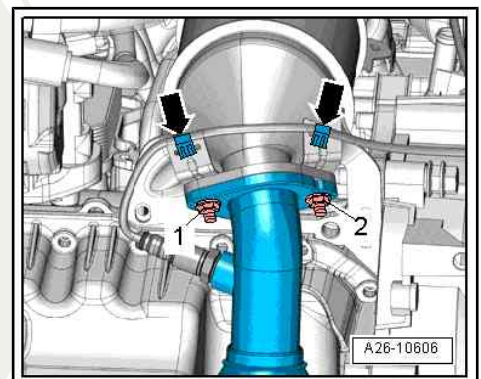
- Attach AC compressor with connected refrigerant hoses to the lock carrier.



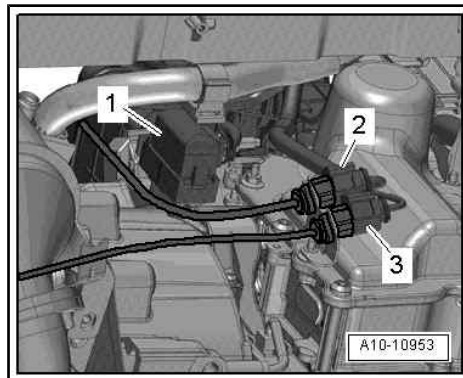
Note

- ◆ *Risk of damage to the decoupling element.*
- ◆ *Do not twist the decoupling element on the pre-exhaust pipe more than 10°.*

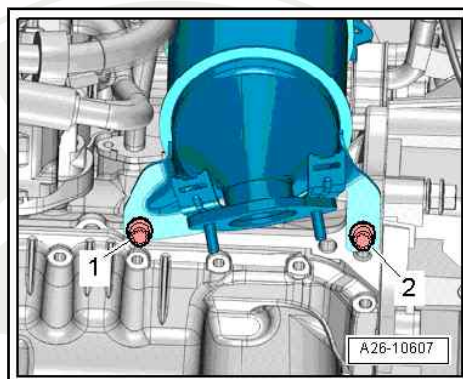
- Unscrew nuts -1- and -2-.
- Expose electrical wiring loom for lambda probe downstream of catalytic converter -G130- -arrows-.
- Separate pre-exhaust pipe from catalytic converter.



- Remove the plug connection -2- for lambda probe upstream of catalytic converter -G39- from the bracket and disconnect.



- Release screws -1- and -2- and remove catalytic converter.



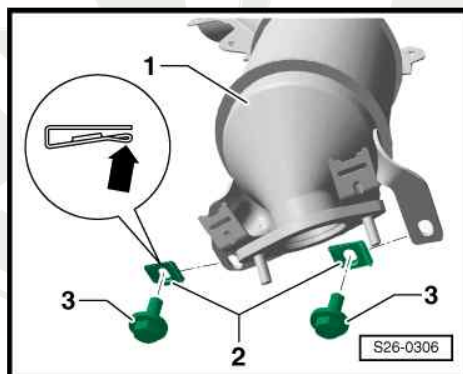
Install

- Push the reinforcement clip -2- -as shown in the illustration- onto the brackets of the catalytic converter -1-.
- The “angle of bend” -arrow- must point downwards.

Use new screws -3- with a larger contact surface ⇒ Electronic catalogue of original parts .

Tighten new fixing screws -3- to 23 Nm.

Further installation occurs in reverse order.



1.4 Replacing middle or rear part of the exhaust system

Special tools and workshop equipment required

- ◆ Body saw e.g. -V.A.G 1523 A -
- ◆ Protective goggles



Note

- ◆ *For individually replacing the middle or rear part of the exhaust system, a separation point is provided in the connecting pipe.*
- ◆ *The separation point is marked by indentations on the circumference of the exhaust pipe.*

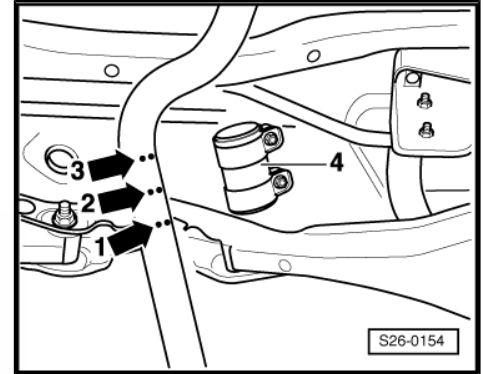
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WARNING

In order to avoid injuries because of metal swarfs, wear safety goggles and safety clothing.

- Separate exhaust pipe at right angles at the separation point -arrow 2- with body saw.
- When installing, position rear clamping sleeve -4- at the side markings -arrow 1- and -arrow 3-.
- Turn the rear clamping sleeve -4- in such a way that the ends of the screws are as far upwards as possible.
- Align rear part of exhaust system horizontally and tighten rear clamping sleeve -4- to 23 Nm.
- Align exhaust system in cold condition free of stress
⇒ [page 199](#).

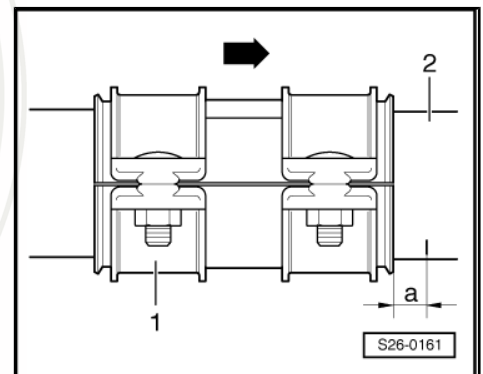


1.5 Aligning exhaust system free of stress

- The exhaust system is aligned when cold.
- Slacken nuts at the clamping sleeve -1- and align to the intermediate pipe -2- (-arrow- points in direction of travel).
-a- = 5 mm

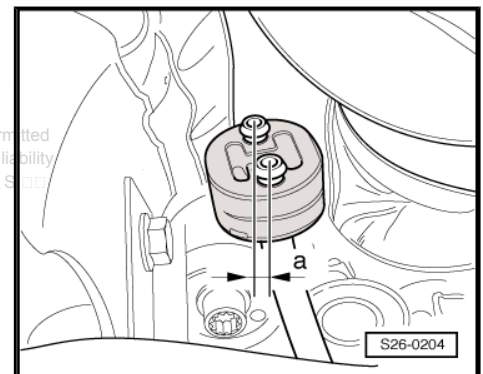
The fixing screws must be located on the right. They must not protrude beyond the bottom edge of the clamping sleeve.

- Tighten the front nut by hand.



- Push the exhaust system so far forward until the dimension -a- of 7...9 mm is achieved between the hanger/body and the hanger/middle part of the exhaust system.
- Tighten bolted connections of the clamping sleeve evenly to 23 Nm.

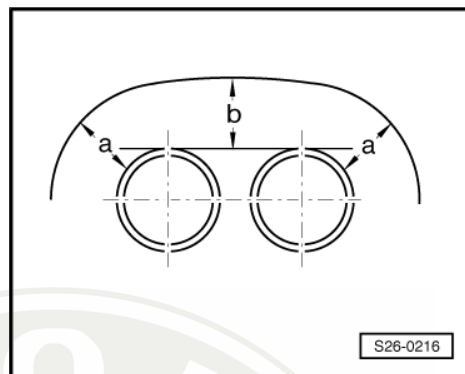
Align exhaust tailpipes





- Align rear muffler in such a way that there is
 - an equal distance between bumper opening and tailpipe -a-.
 - the distance -b- from the bumper opening to the exhaust tailpipes is equal.

For aligning, if necessary the hangers of the exhaust system must be loosened.



1.6 Inspecting the exhaust system for leak-tightness

- Start engine and run in idle.
- Seal off exhaust tailpipes for the duration of the leak check (e.g. with cloth or plug).
- Inspect connection points of cylinder head/exhaust manifold, exhaust gas turbocharger/exhaust pipe etc. for tightness by listening and visual inspection.
- Eliminate any leak found.

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28 – Ignition system

1 Ignition system

1.1 Ignition system - Summary of components

1 - Spark plug, 30 Nm

- ☐ use spark plug wrench - 3122 B- for removing and installing
- ☐ when installing new spark plugs, grease the pencil-type ignition coils (position 2) with lubricating paste -G 052 141 A2- [⇒ page 202](#)
- ☐ Type and electrode spacing $\Rightarrow$ Maintenance ; Octavia II

2 - Cable guide

- ☐ Screwed onto camshaft housing to 5 Nm

3 - Ignition coil with power output stage -(N70, N127, N291, N292)-

- ☐ removing and installing [⇒ page 202](#)
- ☐ when installing new spark plugs, grease the pencil-type ignition coils with lubricating paste -G 052 141 A2- [⇒ page 202](#)

4 - 10 Nm

5 - Hall sender -G40-

6 - O-ring

- ☐ replace if damaged

7 - Knock sensor 1 -G61-

- ☐ Contacts of plug gilded

8 - 20 Nm

- ☐ the tightening torque influences the knock sensor function

9 - Engine speed sender -G28-

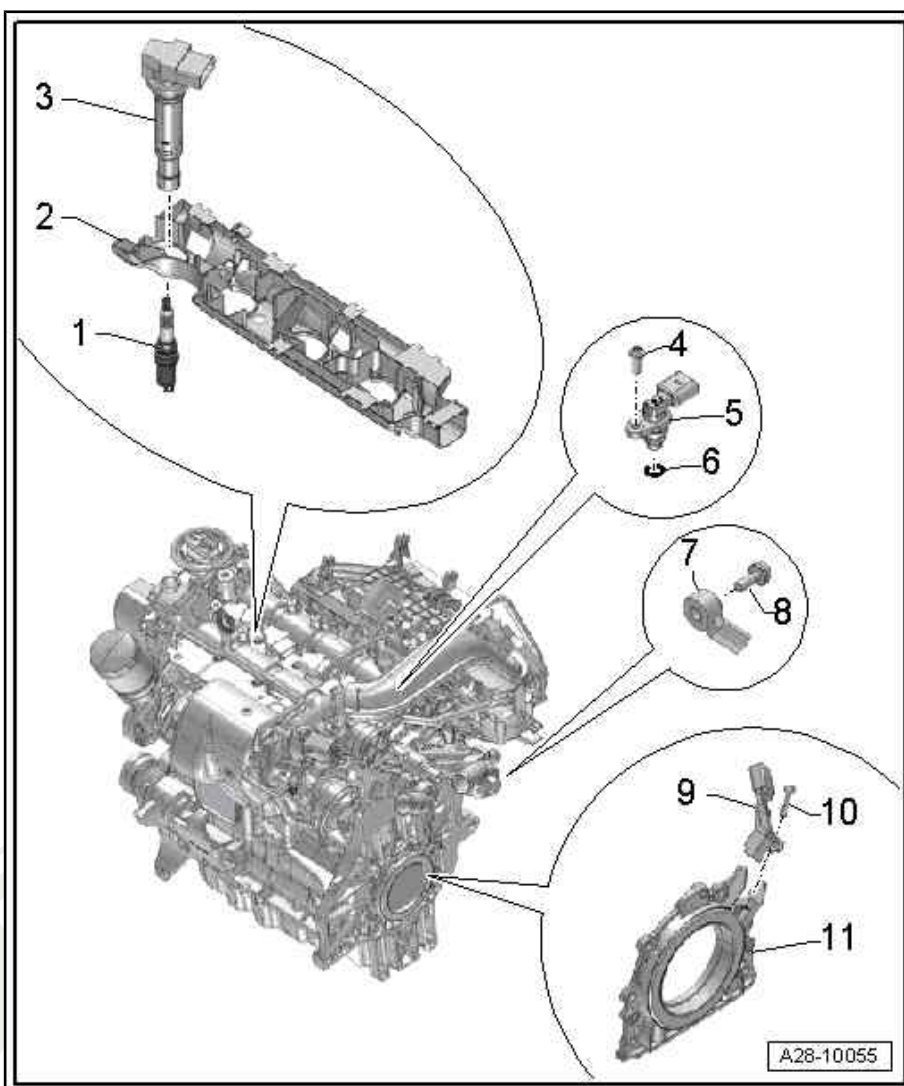
- ☐ removing and installing [⇒ page 203](#)

10 - 5 Nm

- ☐ captive at engine speed sender -G28-

11 - Sealing flange -on the gearbox side-

- ☐ Only replace sealing flange complete with gasket ring and rotor
- ☐ removing and installing [⇒ page 43](#)





1.2 Removing and installing ignition coils with power output stages

Special tools and workshop equipment required

- ◆ Assembly device -T10118-
- ◆ Extractor -T10094 A-

When installing new spark plugs:

- ◆ Lubricating paste -G 052 141 A2-



Note

The housings of the ignition coils with power output stage were changed. This enables the ignition coils to be removed and installed only with the extractor -T10094 A-. The previous extractor -T10094- can furthermore be used if it is machined as described below.

- Remove the marked area -2- using suitable workshop tools in order to achieve the new nominal dimension -B- of 18 mm.
- In addition, mark the tool designation with the character "A" -1-.

Removing

- Remove engine cover ➔ [page 9](#) .

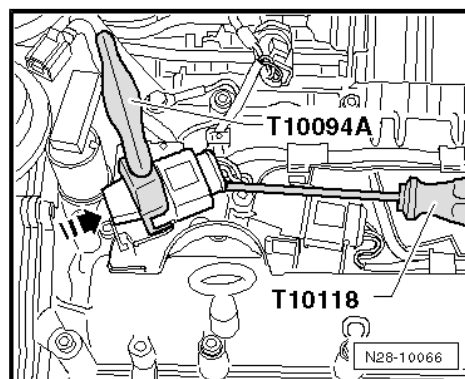
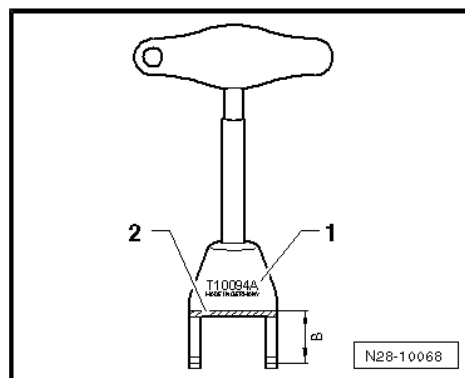
- Position extractor -T10094 A- onto the ignition coil with power output stage -arrow-.
- Slightly pull out the ignition coil with power output stage.
- Position the assembly device -T10118- as shown.
- Carefully unlock the plug lock and disconnect the plug.

Install

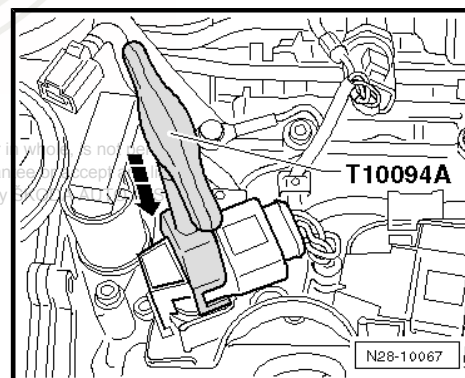
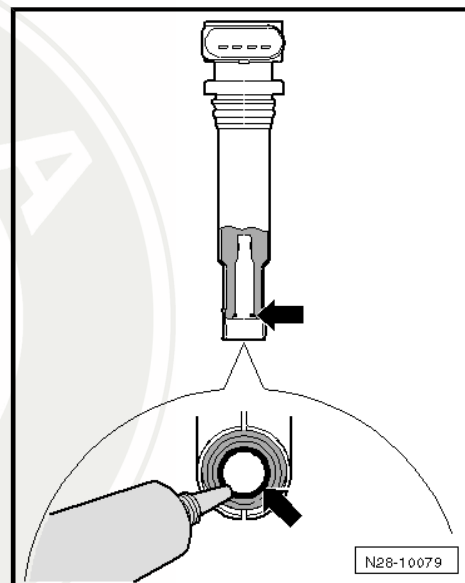


Note

- ◆ *When installing new spark plugs, the ignition coils must be re-greased with lubricating paste -G 052 141 A2-. In doing so, the sealing hose of the ignition coil does not "stick" to the spark plug. The lubricating paste must spread over the spark plug when fitting on the ignition coil.*
- ◆ *The new ignition coils with power output stages are supplied greased.*



- Apply a thin bead of lubricating paste -G 052 141 A2- all around the sealing hose of the ignition coil -arrow-.
- The bead must be 1...2 mm thick.
- Insert all ignition coils loosely into the relevant spark plug shaft.
- Align the ignition coils to the plug connections.
- Push the plugs onto the ignition coils with power output stage until they audibly click into place.
- Position extractor -T10094 A- onto the ignition coil with power output stage.
- Press the ignition coil with power output stage into the cylinder head -arrow-.



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1.3 Removing and installing engine speed sender -G28-

Special tools and workshop equipment required

- ◆ Socket insert -T10370-

Removing

The fitting location of the engine speed sender -G28- is located below the intake manifold at the sealing flange -gearbox side-.

- Disconnect plug -1- from the engine speed sender -G28- .
- Take out the gasket -2- from the cylinder block and remove the engine speed sender -G28- with the socket insert -T10370- .

Install

- Install engine speed sender -G28- and tighten the fixing screw to 5 Nm.

Further installation occurs in a similar way in reverse order to removal.

